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# Scientific poster session

## Cerebrovascular Disease

### PO1:1

### VARIOUS IMAGING FEATURES OF VENOUS INFARCT

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PURPOSE

Diagnosis of the venous infarct is elusive because of wide variety of clinical and radiologic manifestations, mimicking arterial infarct or other disease. This exhibit is to demonstrate various, and educative imaging features of venous infarct on CT, MRI, computed tomographic venography(CTV), and magnetic resonance venography(MRV).

MATERIAL AND METHODS

We will present first normal anatomy of intracranial venous system and its variations on imaging modalities, including CT, MRI, CTV, and MRV with advantages and limitations of each modalities. We will also present various clinical and radiologic features of venous infarct with many educative cases.

RESULTS

Intracranial venous systems divide into the dural sinuses, superficial cerebral veins, deep cerebral veins, and posterior fossa veins. There are many advantages and limitations in the each imaging modalities. In them, CTV is very useful imaging modality to evaluate the intracranial venous system, nearly equivalent to MRV quality. There are important, and helpful imaging clues for diagnosing venous infarct, such as cord sign, empty delta sign, and engorged dark SI on GRE MR images.

CONCLUSIONS

Cerebral venous infarct is a disorder that is challenging to diagnose. It will be helpful to diagnose and differentiate venous infarct from other diseases with a higher accuracy, if we understand pathophysiology and radiologic manifestations of various venous infarct

### PO1:2

### VISUALIZATION OF THE SUPERIOR OPHTHALMIC VEINS BY 3 TESLA 3D-TOF-MR ANGIOGRAPHY

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INTRODUCTION

The superior ophthalmic veins (SOVs) are sometimes visualized on three-dimensional time-of-flight magnetic resonance (3D-TOF-MR) angiograms obtained with a 3 Tesla imager. The purpose of this retrospective study was to determine the incidence of visualization of normal SOVs on 3D-TOF-MR angiograms, as well as their characteristic features.

METHODS

We reviewed 3D-TOF-MR angiograms of 345 consecutive patients obtained with a 3 Tesla MR imager. Patients group comprised 170 males and 175 females, aged 5 to 93 years. Most of the patients had, or were thought to have, cerebrovascular disease.

RESULTS

The SOV was visualized in 13 of the 345 patients (3.8%). In 7 of the 13, the visualized SOV was on the left side, and in 2, it was on the right side. In 4 patients, both the right and left SOVs were visualized; in 2 of these patients, the left SOV was more clearly visualized, and in the other 2, the SOVs were equally visible on both sides. There was a female predominance (M:F=1:12) but no relation between age and visualization of SOVs. None of the visualized SOVs were dilated, and no dilated cavernous sinus was seen. The facial veins and angular veins were also visualized, continuing to the SOVs, suggesting rapid retrograde flow in the facial veins.

CONCLUSIONS

SOVs are sometimes visualized on 3D-TOF-MR angiograms. This phenomenon should not be misdiagnosed as an asymptomatic dural carotid-cavernous fistula.

## PO1:3

### CLINICAL APPLICATION OF INTRAVASCULAR CONTRAST AGENT IN THE FIRST PASS AND HIGH RESOLUTION STEADY STATE MR ANGIOGRAPHY FOR THE STUDY OF CAROTID STENOSIS

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Contrast enhanced MR angiography (CE-MRA) has high diagnostic accuracy in evaluating carotid artery stenosis. The role of CE-MRA in cases of moderate stenosis is debated for a tendency to overestimate the grading of stenosis.

We evaluate the use of Gadofosveset an intravascular agent for studying carotid artery stenosis, in the first pass acquisition and at the equilibrium phase using high resolution sequences.

Ten patients with carotid stenosis (group A) underwent CE-MRA and DSA as standard of reference. CE-MRA protocol included a first pass acquisition with a 3D-FSPGR sequence (voxel size 0.9 mmc). Gadofosveset was administrated at the dose of 0.03 mmol/kg at 0.8 ml/sec. A further high resolution CE-MRA acquisition (isotropic voxel size 0.03 mmc) was obtained at steady state. As a control group, ten patients (group B) were studied using interstitial contrast agent (20 ml at 2.5 ml/sec) and the same first pass CE-MRA protocol. Relative contrast (RC) according to the formula RC = (SV-SF)/(SV + SF) was obtained placing ROIs on vessels and on background in the collapsed first pass angiograms of group A and group B. In group A, the stenosis was graded in both the first pass and high resolution angiograms according to NASCET criteria.

Relative contrast of the first pass CE MRA in group A and group B does not differ significantly ($p>0.05$). In group A, 4/12 stenoses were graded as moderate and 8/12 as severe at DSA. First pass CE-MRA revealed 3 moderate and 9 severe stenosis. High resolution CE-MRA at steady state revealed 4 moderate and 8 severe stenosis.

The intravascular contrast agent allows a panoramic, safe and reproducible evaluation of the first pass images like the interstitial contrast agent. Furthermore the higher resolution at steady state allows a better visualization of the carotid stenosis morphology and improved the assessment of the stenosis grading.

## PO1:4

### FALSE HYPERPERFUSION IN BILATERAL THALAMI AND OCCIPITAL LOBES ON CT PERFUSION OF BRAIN IN A PATIENT WITH BILATERAL CAROTID STENOSIS

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We report CT perfusion of a patient with bilateral carotid stenosis. Perfusion studies were performed before and after angioplasty and stenting of the right carotid artery.

The CT perfusion showed false increase in cerebral blood flow and shortened mean transit time in the bilateral occipital lobes and thalami.

After stenting of right proximal internal carotid artery, the CT perfusion showed normal perfusion on right hemisphere, bilateral occipital lobes and thalami. There was relative hypoperfusion in left cerebral hemisphere.

Therefore, CT perfusion in patient with bilateral carotid stenosis may simulate hyperperfusion in bilateral occipital lobes and thalami. When we see an area with hyperperfusion on a perfusion study of brain, we have to check the possibility of pseudo-hyperperfusion caused by hypoperfusion in other areas.

## PO1:5

### DIFFUSION TENSOR IMAGING IN ACUTE ISCHEMIC STROKE IN CORRELATION WITH THE CLINICAL CONDITION OF PATIENTS. VALUE ESTIMATION

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BACKGROUND

Enabling the evaluation of brain tissue anisotropy, diffusion tensor imaging provides the data on the structural tissue damage in the course of ischemic stroke.

OBJECTIVE

The aim of this study is to assess the correlation between diffusion imaging parameters (rADC, rMD and rFA) and clinical condition of patients in acute ischemic stroke.

MATERIAL AND METHODS

12 patients underwent imaging within the first 24 hours following the onset of clinical symptoms of ischemic stroke. The inclusion criterion was a diagnosed focal lesion with ischemic stroke morphology, observed in the anterior circulation (PACI, TACI) and shown in FLAIR and/or DWI. Patients with strokes other than those with infarction ischemic etiology, as well as patients showing contradictions against MR, were excluded from the group.

Examinations were performed with a 1.5T Toshiba Vantage system. Examination protocol included T2*, FLAIR and DTI. The calculations of DTI parameters (ADC, MD and FA) were done with the use of image analysis software MIStar. The clinical condition of patients was evaluated on hospital admittance and after 20–24 hours following the examination, and then classified on acute Canadian Stroke Scale. rADC, rMD and rFA values were compared with the clinical examination results.

RESULTS

All examined patients (12) had changes in rADC coefficient, rMD (ratio<1) in infarct focus. 5 patients with rFA<1 revealed higher acute CSS score when they were compared with patients with rFA>1 (7).

CONCLUSIONS

Changes in FA values in the early stage of infarction may correlate with the clinical condition of patients. Early FA decrease implies more severe clinical course of infarction. Results need to be confirmed in larger groups of patients.

## PO1:6

### DIFFUSION AND PERFUSION PATTERNS IN HEMODYNAMIC INSUFFICIENCY

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PURPOSE

Reduction of the perfusion pressure caused by vascular stenosis or occlusion is a cause of neurological symptoms and border zone infarcts in the most peripheral parts of the vascular system. The aim of this presentation is to describe the diffusion and perfusion patterns in hemodynamic insufficiency, to clarify the mechanism of cerebral autoregulation and the development of border zone infarctions.

METHODS

Four patients with different duration and cause of hemodynamic insufficiency and borderzone infarctions were selected. The patients shared the typical presentation with fluctuating mild symptoms. The patients were examined with plain CT, MR or CT angiography and MR or CT perfusion subsequently to the stroke symptoms. All patients were examined with diffusion weighted sequences either directly or during the first week after symptom onset.

RESULTS

All four cases showed the typical perfusion patterns following the dynamics of auto regulation in hemodynamic insufficiency with a slight or marked increase of the CBV in the supply area of the affected vessel and an only slightly reduced or maintained CBF in the same region. However the perfusion disturbances were most easily detected on the MTT maps. Minor border zone infarctions along the internal watershed area were seen in all cases.

CONCLUSIONS

The perfusion pattern of hemodynamic insufficiency is characterized by increased CBV, normal or slightly decreased CBF and prolonged MTT in the affected areas.

Border zone infarcts occur mainly in the deep watershed areas.

MR or CT perfusion measurements and DWI provides important information for further treatment of patients with hemodynamic insufficiency.

## PO1:7

### THE HEMODYNAMIC SIGNIFICANT THRESHOLD OF INTERNAL JUGULAR VEINS OBSTRUCTION.

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The goal of our investigation was the determination of internal jugular veins obstruction statistically reliable quantitative criteria by means of ultrasound, magnetic resonance, computed tomography and scintigraphic angiography.

MATERIAL

71 patients with intracranial venous congestion caused by extravasal compression and thrombosis of internal jugular veins (IJV) were examined. 30 persons were included in control group. The venous obstruction degree was determined using the same methods like for arterial lesion examining: ECST, NASCET, CC with the diameter/cross section value correction. The threefold standard deviation of any quantitative index in norm (control group) was accepted as conventional threshold of hemodynamic significant changing.

RESULTS AND CONCLUSIONS

The threshold of hemodynamic significant obstruction reached 70% IJV reducing on the left and 50% IJV reducing on the right, which makes the right side lesion more significant. Only statistically reliable hemodynamic significant criteria were noted: local (3-times blood flow velocity and 1.5-times MR-signal and 2-times CT-contrast density reducing in the lesion vein), regional (monophasive Doppler spectrum; 3-times blood flow velocity reducing along the lesion vein; contralateral IJV 2–2.5-times blood flow velocity increasing and 1.5-times cross section enlarging; more than 1.5-times asymmetry of MR-signal, CT-contrast density and radioactivity in IJVs; blood flow velocity increasing in straight dural sinus and basal veins of Rosenthal), reactive (1.3-times and more MCA blood flow velocity asymmetry index increasing, 0.35-times and less MCA cerebrovascular reactivity index reducing).

## PO1:8

### TOTAL OR NEAR-OCCLUSION CAROTID ARTERY? HOW TO CORRECTLY EVALUATE THESE CONDITIONS

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PURPOSE

Near-occlusion and occlusion are conditions with different therapeutical and prognostic approach. The purpose of this work was to evaluate multi-detector-row CT Angiography (MDCTA) and ultrasonography (US) ability in the differentiation between occlusion and near occlusion of internal carotid artery (ICA).

MATERIALS AND METHODS

98 Consecutive patients who underwent MDCTA and US between January 2007 to April 2007 were retrospectively analyzed. MDCTA and US were compared in order to evaluate the inter-technique agreement. Non-invasive examinations were evaluated for the ability to classify near occlusions as having severe focal stenosis with distal luminal collapse versus diffuse non-focal disease. For the inter-agreement evaluation we used the kappa statistics.

RESULTS

In 14 of 98 patients with 196 ICAs, MDCTA depicted 9 total occlusions and 5 near occlusions. In 12 of 98 patients with 196 ICAs, US depicted 8 total occlusions and 4 near occlusions. Inter-technique agreement between MDCTA and US produced a kappa value of 0.757.

CONCLUSIONS

US performed well in helping to differentiate vessels with focal severe stenosis from those with diffuse disease. MDCTA added little in this group. The inter-technique agreement was very high in studying and differentiating occlusion and near-occlusion of the carotid arteries.

## PO1:9

### CORRELATIVE ANALYSIS BETWEEN THE TYPE OF PLAQUE IN THE CAROTID ARTE-RY AND IN THE CAROTID SIPHON. EVALUATION BY USING MULTI-DETECTOR-ROW CT ANGIOGRAPHY

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BACKGROUND AND PURPOSE

Purpose of this work was to analyze the presence and the type of plaque and degree of stenosis in the carotid artery and in the carotid siphon and to evaluate the presence of potential correlation by using Multi-detector-row CT Angiography.

MATERIAL AND METHODS

We analyzed 60 patients (42 males, 18 females) that underwent to multi-detector-row CT Angiography (MDCTA) for the study of carotid arteries. Contrast material was injected into ante-cubital vein and arterial phase images were obtained by using a 5–6 mLsec flow rate. We searched for the presence of fissured fibrous cap. For all patients axial images, ANGIO MIP and 3D reconstructions were studied. We categorize 90 carotid aces, by evaluating stenosis degree (NASCET criteria), and type of plaque (as fatty, mixed and calcified) and 45 carotid siphons by studying presence of plaque and their type.

RESULTS

We observed 91 plaques in the 120 carotid arteries included in this study and we detected 41 plaque located in the carotid siphon. In the carotid arteries we observed 36 calcified plaques, 22 mixed plaques and 26 fatty plaques. In the siphon we observed 33 calcified plaque, 4 mixed plaque and 5 fatty plaques. By analyzing the relationship between plaques located in the carotid and in the siphon we observed a statistical correlation between the calcified plaque located in the carotid and in the siphon ($p<0.05$).

DISCUSSION AND CONCLUSIONS

The presence of calcified carotid plaque in the carotid artery is associated a calcified plaque in the carotid siphon (when the plaque is present). There is no statistical association between the presence of mixed and fatty plaque in the carotid and similar type of plaque in the carotid siphon. These results suggest that the aetiology and pathology of atherosclerosis in the extracranial carotid arteries is different from the intracranial ones.

## PO1:10

### FISSURED FIBROUS CAP OF THE CAROTID ARTERY: ANALYSIS BY USING MDCTA

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PURPOSE

Purpose of this work was to evaluate the diagnostic efficacy of multi-detector-row CT Angiography (MDCTA) in the study of fissured fibrous cap of the carotid artery through the comparison with the surgical specimens

MATERIAL AND METHODS

65 patients (42 male, 23 female; mean age 62 years; age range 42–84 year), for a total of 130 carotid, were examined by using a multi-detector row CT scanner. The following features were analyzed: presence of fissured fibrous cap and degree of stenosis (on the basis of North American Symptomatic Carotid Endarterectomy Trial Criteria). For all patients axial images, ANGIO MIP and 3D reconstructions were studied. A total of 21 patients had surgery (14 male and 7 female; average age 67 years; age range 48–84 years) and CT data have been compared with the surgical results. We performed a statistical assessment from our data.

RESULTS

MDCTA detected 19 fissured fibrous cap in the 130 carotid. The surgical confirmation showed a 69.9% sensitivity (95% CI Sensitivity= 0.436–0.956), specificity of 83.2% (95% CI specificity=0.613- 1), positive predictive value 0.784 (95% CI PPV=0.567- 1) and negative predictive value 75.1% (95% CI NPV=0.547–0.978). We observed a statistical correlation between number of fissured fibrous caps and the severity of stenosis ($p=0.035$).

CONCLUSIONS

Results of our study confirm previous work that multi-detector-row CT can study fissured fibrous cap, although sensitivity values are sub-optimal. The number of patients with fissured fibrous cap increased with the severity of stenosis.

## PO1:11

### ULCERATED CAROTID PLAQUE: MDCTA IMAGING FEATURES

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PURPOSE

Ulcerated carotid plaque is an important risk factor for cerebrovascular events. Aim of this work is to describe multidetector-row CT Angiography imaging features of ulcerated carotid plaque.

MATERIAL AND METHODS

MDCTA images of 37 patients (29 males; 8 females; mean age 70 years, age range 57–81 years) with carotid ulcerated plaque surgically confirmed by CEA were reviewed. MDCTA exams were performed with a multi-detector row scanner, after intravenous bolus administration of 130 mL of non-ionic contrast material using a 3–5 mL/sec flow rate. We assessed each patient by using axial scans, multiplanar reconstruction (MPR), maximum intensity projection (MIP), single surface display (SSD) and volume rendering (VR) techniques. In some patients we performed an histological analysis.

RESULTS

We observed that plaque ulcerations increased with severity of stenosis and soft plaques showed this lesion more easily (2437). Morphology of ulcerated carotid plaque is widely variable but we observed in particular “crateriform” morphology. 3-D images, and specially VR, showed an high efficacy in the characterization of plaques ulceration.

CONCLUSIONS

Carotid plaque ulceration is an important plaque complication and to know its different aspect in CTA is important to correctly detect it. Fatty plaque and high grade stenosis are the most frequent localization for ulcerated plaque and usually it is present a crateriform morphology. Sometimes differential diagnosis may be not simple in some type of dissections. Presence of parietal calcifications may produce artefacts.

## PO1:12

### KINKING AND COILING: MULTI-DETECTOR-ROW CT ANGIOGRAPHY IN THE EVALUA-TION OF CAROTID ARTERY COURSE ANOMALY

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Learning Objectives:

1) To describe the anatomy and the difference between kinking and coiling carotid artery

2) To understand physiology and physiopathology and flow vascular effects produced by kinking and coiling.

3) To review the CTA technical parameter to be used, as well as the correct delay time, concentration and volume of contrast material and which techniques can be used including the visualization difference between maximum intensity projection (MIP), multi-planar reconstruction (MPR) and volume rendering (VR).

Abstract

In the carotid artery, elongation and tortuosity are fairly common and this conditions produces kinking and the coiling.

Carotid insufficiency derived from kinking or coiling is a well known situation, and the prevalence of hypertension or neurological symptomaticity in subjects with kinking is higher than in subject without this anomaly.

The purpose of this education exhibits is to describe the anatomy of kinking and coiling and to review the CTA technical parameter to better define this pathology. We described moreover the indication and visualization difference between maximum intensity projection (MIP), multi-planar reconstruction (MPR) and volume rendering (VR). We presented relevant case studies and reconstructed images

## PO1:13

### UNILATERAL VISUAL LOSS AFTER ISCHEMIA IN RIGHT CALCARINE REGION: FMRI AND DTI FOLLOW-UP

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PURPOSE

This study tested the possibility to explain the variation in clinical outcomes by the integration between hemodynamic responses and structure of white matter tracts in a patient with vascular brain damage using functional magnetic resonance imaging (fMRI) and diffusion tensor imaging (DTI).

METHODS AND MATERIALS

Data were obtained from a 24 years old woman with left hemianopsia. fMRI and DTI images were acquired using a 1.5 tesla machine at the onset and one mounth after an ischemia involving right calcarine region. Cortical activation was evoked by visual stimuli presented during fMRI sessions. Block-design paradigm, composed of 20 alternating 15-second periods of rest and stimulation, lasted 5 minutes; ocular movements were tracked. Visual stimuli were flashed in the centre of visual field, then in the peripheral right (RVF), and in left visual field (LVF). DTI analysis was focused on retrogeniculate white matter optic radiations.

RESULTS

fMRI results demonstrated that in the first examination, stimulus in central VF activated visual cortex in the left hemisphere more than in the right; at the second examination the activation was similar in both hemispheres. During the presentation of the visual stimuli in RVF, visual cortex was activated in both exams. Stimuli in LVF did not evoked any activation in visual cortex in the first exam; one month later, cortical activation was comparable to that evoked by RVF stimulation. In the first examination DTI demonstrated a reduction of the mean fractional anisotropy in the right hemisphere compared to the left one. In the second examination this difference decreased. Fibres direction was normal both in the first and in the second exam.

CONCLUSIONS

fMRI can be used in patients affected by neuro-ophthalmological diseases to demonstrate functional damage and recovery. DTI can provide further information to explain fMRI results and to predict the evolution of the disease.

## PO1:14

### HEADACHE ASSOCIATED WITH SEXUAL ACTIVITY – IS THERE A NEED FOR FUR-THER IMAGING WORKUP?

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INTRODUCTION

Primary headache associated with sexual activity is a distinct form of primary headache disorder recognized by the International Classification of Headache Disorder II edition (ICHD II). It may either represent a benign or a malignant form of headache with intracerebral hemorrhage, subarachnoid hemorrhage or cerebral infarction. It is known that some angiographic disturbances like vasospasm in acute phase can be spontaneously reversible and that in most cases not lead to brain lesions.

CASES REPORTS

We present four under 40-year-old patients with unremarkable medical history and without smoking habits, oral contraceptive use or substance abuse. Their headaches fulfilled the ICDH II criterion's (one case of preorgasmic headache and three cases of orgasmic headache). The inter-critical neurological examination was normal in all cases and there was no association with other primary exertional headache, migraine or other kind of headache. Magnetic Resonance imaging (MRI) scans were made out of the acute phase and in all of them showed mild subcortical white matter lesions. MR angiography (MRA) in two of them demonstrated arterial narrowing, in one of them in intracavernous segment of internal carotid artery and in the beginning of the right A1 segment and in the other patient in the M1 segment of the left middle cerebral artery. There were not cortical ischemic lesions or hemorrhagic ones.

CONCLUSIONS

These cases illustrate that arterial narrowing in primary sexual headache may be a long-lasting phenomenon, not only found in the acute phase and can lead to further neuroradiological workup. Investigation should include Compute Tomography, MRI and an arterial angiography (CTA, MRA or Digital Subtraction Angiography).

## PO1:15

### UNUSUAL MIGRATION OF THE DISTAL CATHETER OF A VENTRICULOPERITONEAL SHUNT INTO THE HEART VIA INTERNAL JUGULAR VEIN

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PURPOSE

A ventriculoperitoneal (VP) shunt is the most common way of treatment for hydrocephalus. Cervicothoracic complications with VP shunts are rare, but we present extremely rare case of the distal migration of distal catheter of a VP shunt into heart, via internal jugular vein.

MATERIALS AND METHODS

A 68-year-old woman, who underwent the placement of right frontal VP shunt due to a hydrocephalus developed after aneurysmal clipping, presented mental declination.

RESULTS

Serial plain chest X-rays and computed tomography revealed the distal catheter to be gradually pulled into the internal jugular vein, and finally into the right ventricle of the heart. A right lower neck incision was performed to access the distal catheter, which was then slowly pulled up out of the heart, but failed to pass through superior vena cava because of the large size of distal catheter knotted. After cutting the catheter at lower neck level, it was ensnared and pulled out through femoral vein by the interventional procedure.

CONCLUSIONS

The migration of the distal catheter of a VP shunt probably occurred with the perforation of internal jugular vein near the distal catheter tract. Slow venous flow and negative inspiratory pressure may have gradually pulled the catheter up into the right atria and ventricle of the heart. It can be extracted safely in the interventional procedure with transfemoral venous approach.

## PO1:16

### CEREBRAL VENOUS SYSTEM ANATOMY USING SWI: A PICTORAL ESSAY

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PURPOSE

Susceptibility weighted imaging (SWI) is a novel MRI technique that combines magnitude and phase information from a high spatial resolution 3D gradient-echo sequence. It is highly sensitive to the difference in magnetic susceptibility of various substances compared to their neighbouring backround tissue, showing excellent image contrast and depicting anatomic structures, such as small veins, in great detail. The purpose of this pictoral essay is to review and illustrate the anatomy of the cerebral deep venous system using SWI.

METHODS AND RESULTS

Exams of adult patients imaged with a SWI sequence using a 1.5T MR unit were retrospectively reviewed, paying particular attention to the different anatomic structures of the cerebral deep venous system.

CONCLUSIONS

SWI increases the conspicuity of small veins and allows the understanding of detailed vascular anatomy of the cerebral venous system, providing the background to growing use of this technique in the evaluation of vascular diseases of the brain.

## PO1:17

### MISDIAGNOSIS OF INFARCTION IN HYPERACUTE STROKE PATIENTS

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OBJECTIVE

To analyze the presence of non-vascular symptomatic brain lesions in a large cohort of patients clinically diagnosed of hyperacute stroke.

METHOD

Observational, prospective study in acute stroke patients in whom a MRI scan was obtained within the first 6 hours after symptom onset. Uncooperative patients, and those with altered level of consciousness or lacunar syndrome were excluded because these patients are initially assessed with CT in our hospital.

RESULTS

The study included 413 patients classified into the following etiological groups: territorial infarction (anterior and posterior circulation), lacunar infarction, internal watershed infarction, acute intraparenchymal hematoma, brain tumor, status epilepticus, and other non-vascular symptomatic lesions.

Among the total, 327 patients (79.2%) had a potentially fibrinolytic infarction (72.4% anterior circulation and 6.8% posterior circulation).

Lacunar and watershed infarctions were present in only 15 (3.6%) patients.

An additional 71 (17.2%) patients had non-ischemic symptomatic lesions such as acute hematoma (33 patients), cortical edema secondary to status epilepticus (8 patients), symptomatic brain tumors (4 patients), and others (subdural empyema, meningoencephalitis, subarachnoid hemorrhage, and hypoglycemia (4 patients). Twenty-two (5.3%) patients had a normal brain MRI and brain infarction was excluded by clinical or imaging follow-up.

Non-treatable stroke mimics represented 20.8%, and 11.6% had a symptomatic lesion demonstrated by MRI that could have been easily overlooked on CT.

CONCLUSIONS

Brain MRI obtained in a selected population of hyperacute stroke patients, who were potential candidates for thrombolytic treatment showed a significant proportion of non-treatable situations. More than half of these lesions (lacunar and watershed infarctions, normal studies, non-vascular symptomatic lesions) might have been easily overlooked on CT. In addition to the well-recognized advantages of multimodal MRI in selecting stroke patients for thrombolytic therapy, this technique can exclude a significant proportion of patients from this treatment.

## PO1:18

### INCIDENCE OF VASOSPASM AFTER INTRACEREBRAL HEMORRHAGE

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Cerebral vasospasm is a frequent and dangerous complication of aneurysmal subarachnoid hemorrhage (SAH). Only a few cases of cerebral vasospasm after intracerebral hemorrhage (ICH) have been reported. In this study digital subtraction angiographies (DSA) of patients after ICH were evaluated to determine incidence of vasospasm.

METHODS

60 patients with ICH (26 women and 34 men, age between 20 and 69 years, mean age 49.6 years ± 13.9 SD) who underwent cerebral arteriography were included in this study. Cerebral vasospasm was graded as mild (up to 25% of vessel narrowing), moderate (26–50% of vessel narrowing) and severe (more than 50% of vessel narrowing).

RESULTS

Vasospasm of the ispilateral middle cerebral artery (MCA) to the ICH was found in 13 patients (21.6%), ipsilateral anterior cerebral artery (ACA) in 4 patients and of the posterior cerebral artery (PCA) in one patient. Two patients had spasm of the contralateral MCA. Severe MCA spasm was found in three, moderate in five, and mild also in five patients. All cases of ACA and PCA spasm were assessed as mild.

CONCLUSIONS

Cerebral vasospasm is rather frequent finding in patients after ICH. The status of the cerebral vasculature in these patients needs to be assessed and monitored.

## PO1:19

### PERSISTENT FALCINE SINUS DEMONSTRATED BY MR VENOGRAPHY: REPORT OF TWO CASES

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The falcine sinus is located between the dural leaves of the falx cerebri, connecting the vein of Galen and superior sagittal sinus. It is considered to develop from the sagittal plexus of veins, a mesh of anastomotic venous channels along the primitive falx cerebri, and disappears before birth. A defect in the development of the straight sinus or hypoplasia of the posterior third of the superior sagittal sinus distal to the falcine sinus can contribute to the persistence of the falcine sinus, as a collateral pathway.

The persistent falcine sinus is associated with various anomalies, such as vein of Galen malformation, bifid cranium, arteriovenous malformations, corpus callosum agenesis, osteogenesis imperfecta, Chiari malformation II, occipital encephalocele, and absent tentorim. A persistent falcine sinus without associated anomalies is extremely rare.

We describe two cases of the persistent falcine sinus, demonstrated by MR venography. One was 58-years-old female patient, presented with longstanding headache, and MRI demonstrated the persistent falcine sinus with the agenesis of the straight sinus and partial absent tentorium. The other case was 11-years-old female patient, presented with the parietal scalp mass along midline since birth, and CT and MRI revealed the persistent falcine sinus with the hypoplastic straight sinus and skull defect. The scalp mass was excised and proven as atretic cephalocele pathologically.

## PO1:20

### CONTRAST ENHANCED MR NEUROIMAGING PROTOCOLS AT 1.5T AND 3T: RESULTS OF AN EXPERT CONSENSUS PANEL

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PURPOSE

To develop contrast-enhanced MR neuroimaging protocols optimized for the specific examination being performed and the field strength being used.

METHODS

A multi-institutional panel of expert neuroradiologists was convened to evaluate and discuss MR neuroimaging protocols at 1.5 and 3T. All participants used 1.5T as well as 3T machines in their research and clinical practice. Together, the panelists developed protocols for commonly performed studies (whole brain, spine, neurovascular, acute stroke, and multiple sclerosis) as well as for more specialized indications (IAC and cranial nerve, orbits, pituitary, and seizures). For each technical parameters (ie, FOV, TR, TE, ETL, NEX, etc), an absolute value or range of values was specified. Each protocol also included recommended slice thickness and gap, plane(s) of recon-

struction, and notes on special sequences (IR, fat saturation, magnetization transfer) that were recommended or discouraged. Annotations captured possible variations on approaches suggested by the panel. All recommended protocols were subsequently tested and further optimized as necessary prior to finalization.

RESULTS

Optimized neuroimaging protocols applicable at multiple institutions have been developed. 3T protocols were optimized to take benefit from the high SNR provided by while minimizing SAR issues. A standard dose of 0.1 mmol/kg bodyweight is recommended for most protocols, however, this dose may be reduced with the use of a high-relaxivity contrast agent. For certain exams at 1.5T (eg, pituitary lesions and acoustic neuromas) and for most studies performed at 3T, a half dose of 0.05 mmol/kg may be adequate, particularly when a higher-relaxivity contrast agent is used.

CONCLUSIONS

Neuroimaging protocols were optimized for the type of examination being performed and for the coil and field strength of the scanner being used. The use of high-relaxivity contrast agents provides optimal enhancement at the lowest possible dose, maximizing contrast enhancement and patient safety.

## PO1:21

### CAN PROTON SPECTROSCOPY PREDICT CLINICAL OUTCOME AFTER BRAIN STROKE?

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PURPOSE

To assess the role of 1H MRS in the detection of changes in cerebral metabolite levels in pyramidal tracts after cortical/ subcortical infarction and to compare metabolite alterations to clinical outcome (Barthel index, Scandinavian Stroke Scale).

MATERIALS AND METHODS

21 patients who underwent supratentorial cortical/ subcortical infarction were studied, 1 month after the onset of clinical symptoms of ischemic stroke. The MR studies were performed on 1.5 T system. The results of spectra approximation (presented as metabolite ratios: NAA/Cr, Cho/Cr, lac/Cr, lip/Cr) were subjected to statistical analysis. MR spectra were recorded from normal appearing brain region: contra and ipsilateral internal capsule and cerebral peduncles. Spectra from stroke patients were compared with control group from 32 healthy volunteers recorded with the same techniques.

RESULTS

The statistical analysis revealed significant differences between data obtained from the various regions in the same patients who had undergone ischemic stroke and between the infarcted and control groups. Proton MR spectroscopy detects changes in cerebral metabolites levels also in apparently normal regions. In contralateral brain regions, as well as in the internal capsule we have noticed significant reduction of NAA and increase of Cho and lac; we found correlation between NAA level and Barthel index and between lac/Cr and Scandinavian Stroke Scale.

CONCLUSIONS

Proton MRS is very useful tool for evaluation major changes in metabolite levels in pyramidal tracts after brain stroke. Our preliminary results of 1H MRS, MRI and clinical data support the idea that metabolic lesions distant from the infracted tissue can be responsible for clinical course and have predictive value.

## PO1:22

### PATHOMECHANISMS OF SYMPTOMATIC DEVELOPMENTAL VENOUS ANOMALIES

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OBJECTIVE

While it is generally accepted that Developmental Venous Anomalies (DVAs) are benign vascular malformations, over the past years, we have experienced symptomatic DVAs that, together with various reports describing complicated DVAs have fuelled our interest in reviewing how and when DVAs can become clinically significant.

METHODS

Charts and angiographic films of 17 patients with DVAs whose 18 vascular symptoms could be attributed to a DVA were selected from a neurovascular databank of our hospital. In the literature, 51 cases were found that fulfilled our criteria of well-documented symptomatic DVAs. MRI had to be available to rule out any other associated disease.

RESULTS

Mechanical (obstructive or compressive) pathomechanisms accounted for 14/69 symptomatic patients and resulted in hydrocephalus or nerve compression syndromes. Flow related pathomechanisms were present in 49/69 patients and could be subdivided into complications resulting from an increase of flow into the DVA (owing to an arteriovenous shunt using the DVA as drainage route; n=19) or a decrease of outflow (n=26) or a remote shunt with increased venous pressure (n=4) leading to symptoms of venous congestion. In six cases, no specific pathomechanism were detected.

CONCLUSIONS

DVAs, as extreme variations of normal venous drainage may represent a more fragile venous drainage system that may be more easily affected by in-and outflow alterations. Although DVAs should be considered benign, in the above mentioned rare circumstances, they can be symptomatic. The integrity of the DVA needs to be preserved irrespective of the treatment that should be tailored to the specific pathomechanism.

## PO1:23

### ADDED VALUE OF HIGH RESOLUTION SUSCEPTIBILITY-WEIGHTED MR IMAGING TO EQUIVOCAL CONVENTIONAL MR IMAGING FINDINGS IN SELECTED NEUROLOGIC DISORDERS INVOLVING LEPTOMENINGEAL AND MICROVASCULAR STRUCTURES A

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PURPOSE

The purpose of this study is to demonstrate the unique patterns of susceptibility signals on high resolution susceptibility-weighted MR imaging (HRSWI) in the selected neurologic disorders involving leptomeningeal and microvascular structures and to describe added value of HRSWI to equivocal findings of conventional MR imaging in above selected cases.

METHODS

22 patients with suspected leptomeningeal or microvascular disease on conventional MR imaging underwent HRSWI at 3T. Two experienced neuroradiologists blindly and separately reviewed two MR imaging sessions (conventional MR imaging vs HRSWI), which were spaced 4 weeks apart to avoid recall bias. The level of interobserver variability was determined in the analysis of two MR imaging session. For differential diagnosis of suspected leptomeningeal or microvascular disease, we assessed the degree and morphology of susceptibility signals in HRSWI and compared it with conventional MR imaging findings. we demonstrated added value of HRSWI to conventional MR imaging in selected cases with leptomeningeal or microvascular disease.

RESULTS

HRSWI improved visualization of leptomeningeal carcinomatosis and primary or secondary leptomeningeal lymphoma which are equivocal on conventional MR imagings. HRSWI also improved visualizations of leptomeningeal and transdural anastomoses as well as Moyamoya vessels in Moyamoya patients. “Beaded” appearance of cerebral venous structure on HRSWI was unique feature in posterior reversible encephalopathy syndrome (PRES). HRSWI had advantage in detection of vascular malformations with slow flow including developmental venous anomaly compared to conventional MR imaging.

CONCLUSIONS

HRSWI provides added information to conventional MR imaging in differential diagnosis of selected cases with suspected leptomeningeal or microvascular disease.

## PO1:24

### THE USEFULNESS OF THIN-SLICE RECONSTRUCTION AFTER ACQUISITION OF BRAIN CT WITH THICK COLLIMATION

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PURPOSE

With the advent of multi-detector row CT (MDCT), faster and thinner scanning became available. Since MDCT consists of arrays of thin detector rows, it became technically possible to reconstruct thin-slice images after obtaining images with thick collimation. However, brain CT has usually been obtained only with 2.5 to 5-mm thickness without routine reconstruction of thin-slice images. The purpose of this study was to investigate whether additional reconstruction of 1.25-mm images from 5-mm collimation scans of the brain may provide additional information.

METHODS

From January 2006 to November 2007, a total of 8560 patients underwent brain CT with or without contrast enhancement. All brain imaging was performed by 4-slice brain MDCT with a collimation of 1×5 mm, a scan increment of 5 mm, and sequential mode. Thirty 5-mm images were first reconstructed and subsequently, four 1.25-mm images were reconstructed from each 5-mm image. Using a dedicated 3D workstation and software (AquarisNET server, Terarecon), coronal reformation was performed and maximum intensity projection (MIP) images were reconstructed for artery evaluation in patients who underwent post-contrast scanning. Retrospectively, two neuroradiologists reviewed CT in consensus to find particular clinical settings where 5-mm CT did not show abnormalities but thinly reconstructed images did.

RESULTS

We found the clinical settings where abnormalities were not identified on routine 5-mm CT but on thinly reconstructed images. These abnormalities included subtle fracture of the orbit (particularly at the inferior wall), a small amount of acute subdural hemorrhage, a small acute thrombus using a hyper-attenuated artery sign, incidental unruptured aneurysm, mild focal stenosis in the intracranial arteries, and asymptomatic steno-occlusive disease.

CONCLUSIONS

Thin-section reconstruction after obtaining brain CT with thick collimation can provide additional information by detecting subtle lesions, which may change diagnosis and treatment plan without additional radiation exposure.

## PO1:25

### The roles of standard and advanced techniques of Magnetic Resonance Imaging (MRI) in diagnosing different neurological diseases - our experiences

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PURPOSE

Non invasive neuroimaging techniques Computed tomography and Magnetic Resonance have the important roles in neuroradiology. (The special places take) Development of MRI with standard and advanced techniques has contributed enormously to pathomorphological diagnosis and more precise anatomic localization. The aim is to show our experiences in neurological diseases diagnosing with the application of different techniques of Magnetic Resonance.

MATERIAL AND METHODS

We have done about 600 MR examination on MRI 1,5 T General electric (GE) since February 2008. Patients with different neulogical pathology have been scanned. Brain and neck MR, different parts of spine, head and neck angiography have been done (without and by injector contrast intravenous application). Different standard protocols and nonstandard (advanced) techniques have been used-Diffusion weighted images, Diffusion tensor images, MR spectroscopy and MR perfusion.

RESULTS

Approximately 70% of all patients have been given in-patient treatment, (the average age is 60±25, 5, and male and female ratio is 3:2). Cerebrovascular diseases have been the most frequent group of diseses- 73% of all cases(infarction of different localisation and in different phases, infarct with hemorrhagic transformation, aneurysms, deep venous thrombosis, AV mafomations, solitar and multiple cavernomas and subdural haemathomas); Primary and secondary tumor of head and spine in 13% of all cases; White matter diseses (ADEM, MS and myelinolysis) in 10%.Other patients have had neurodegenerative, infective and congenital diseases. Advanced tehniques have been used for differentiation: ishemic lesion vs low grade tumor, demyelination vs ishemia, haemorrhage vs bleeding in tumor, pre and postoperative stage of tumor gradus determination.

CONCLUSIONS

Standard and advanced MRI techniques have very important role in determination of the nature of lesions-ischemic, demyelination, hemorrhagic, localization-accent for the lesion in fossa cranii posterior, phases of ischemic lesions, evaluation of degenerative and atrophic lesions, and differentiation of focal lesions.

Keywords

cMRI

noncMRI

differential diagnosis of neurological diseases

## PO1:26

### MORPHOLOGIC FEATURES AND FLOW VOID PHENOMENON IN NORMAL PRESSURE HYDROCEPHALUS (NPH) AND OTHER DEMENTIAS: ARE THEY REALLY SIGNIFICANT?

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NPH is an important cause of dementia in the elderly; however, NPH is often difficult to differentiate from normal aging and other dementias in which brain atrophy with ventricular dilatation is present. To determine the distinctive features of NPH and other dementias, we used routine MR imaging to investigate the morphologic parameters (dilatation of sylvian cisterns, narrowness of superior convexity space and size of PHFs) and flow void phenomenon in patients with NPH and other dementias compared with controls. We retrospectively examined routine MR images of 18 NPH cases, 11 patients with other dementias and 20 controls. The morphologic features and the flow void phenomenon were graded subjectively. Significant differences between NPH patients and controls/other dementias were found for the flow void phenomenon by the subjective method. There is no significant difference of the morphologic parameters between NPH patients and controls/other dementias. Significant differences between patients with other dementias and controls/NPH group were found for the morphologic features (Mann-Whitney test). Our results indicate that the flow void phenomenon strongly support the diagnosis of NPH. Morphologic analysis of MRI can be distinctive for NPH or other dementias. We suggest the detailed evaluation of the morphologic features and the flow void phenomenon in routine MRI work up of dementia.

## PO1:27

### PROTON-MR SPECTROSCOPY IN NORMAL PRESSURE HYDROCEPHALUS AND OTHER DEMENTIAS

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Differentiation of normal pressure hydrocephalus (NPH) from other types of dementia remains a clinical challenge. The aims of this prospective study were to assess the efficacy of cerebral metabolites depicted by proton MR spectroscopy (MRS) in distinguishing NPH from other dementias and determine the relationship of this profile with white matter hyperintensity (WMH). The study included 18 patients with NPH, 11 patients with other types of dementia and 20 control subjects. Ratios of NAA/Cr, NAA/Cho, Cho/Cr from deep white matter were measured and compared with WMH scores. NPH cases and patients with other type dementia showed decreased ratios of NAA/Cr, NAA/Cho in the deep white matter compared with control group (Mann-Whitney test). No correlations were found between Cho/Cr and WMH in NPH and patients with other type of dementia (Kruskal-Wallis test). There was no correlation between Naa/Cr, Naa/Cho and Cho/Cr in NPH cases compared with other type of dementia group. Results of our study support the idea that NPH and dementia are associated with the white matter ischemia. WMH might relate to axonal degeneration or process of natural aging. WMH or MRS findings should not be useful in differentiating NPH from other types of dementia. Naa/Cr, Naa/Cho, Cho/Cr and WMH could not be used as distinguishing characteristics of these two disorders.

## Craniocerebral trauma

## PO2:28

### PROTON MR SPECTROSCOPY IN MILD TRAUMATIC BRAIN INJURY

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PURPOSE

To assess the role of 1H MRS in the detection of changes in cerebral metabolite levels in pyramidal tracts after mild traumatic brain injury (MTBI) and to compare metabolite alterations to clinical status (Glasgow Coma Scale).

MATERIALS AND METHODS

Study group consists of 26 patients after mild traumatic brain injury with 11 to 15 score in GCS. The MR studies were performed on 1.5 T system. The results of spectra approximation (presented as metabolite ratios: NAA/Cr, NAA/Cho, Cho/Cr, lac/Cr, lip/Cr, Glx/Cr) were subjected to statistical analysis. MR spectra were recorded from normal appearing brain region: internal capsules and cerebral peduncles. Spectra from traumatic patients were compared with control group-32 healthy volunteers recorded with the same techniques.

RESULTS

The statistical analysis revealed significant differences between data obtained from the various regions in the same patients who had undergone MTBI and between the study and the control groups. Proton MR spectroscopy detects changes in cerebral metabolites levels in apparently normal regions. In pyramidal tracts (the internal capsules, cerebral peduncles) we have noticed significant reduction of NAA /Cho, lip/Cr, lac/Cr and Glx/Cr.

CONCLUSIONS

In patients with mild brain injury we can detect some metabolite abnormalities in normal appearing brain structures. Proton MRS is very useful tool for evaluation major changes in metabolite levels in pyramidal tracts after mild traumatic brain injury.

## PO2:29

### APPLICATION OF REVERSE ENGINEERING TECHNOLOGY INTO CRANIOPLASTY PROSTHESIS MANUFACTURING

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PURPOSE

The aim of the study is to present the application of reverse engineering technology into biomedical engineering, concerning cranioplasty prosthesis manufacturing.

METHODS

In 10 patients with skull focal bone loss after craniectomy CT was performed in Radiology Department of Cracow University Hospital to obtain data for reverse engineering.

In every case in Cracow University of Technology the virtual model of the skull was generated using computer aided design software CATIA.

The virtual model was the base for designing the cranioplasty prosthesis. There were 2 ways of the reverse engineering applications. The first way gave a chance for manufacturing the material model of the skull with hole, which was used by surgeon for preparing the universal prosthesis before surgery operation. On the second way, the virtual model was the base for direct designing the individually adjusted prosthesis for cranioplasty.

Finally the prosthesis was implanted into patient during neurosurgery in the Neurosurgery Department of Cracow University Hospital.

RESULTS

Till now the universal prosthesis for cranioplasty made of polypropylene and polyester was manually adjusted to the hole in skull by surgeon during operation, which took a lot of time (about 1 hour). This was a universal prosthesis so in many cases its fitting was not good enough.

After the application of reverse engineering, time needed for adjustment during operation was reduced to a few minutes and the prosthesis was much better fitted.

CONCLUSIONS

Manufacturing of individually adjusted prostheses using reverse engineering technology should be commonly used in patients planned for cranioplasty.

## PO2:30

### COMPUTER-AIDED ASSESSMENT OF INTRACRANIAL VOLUME RESERVE

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AIM

Monitoring the changes in intracranial volume (ICV) reserve and intracranial pressure (ICP) is one of the key issues in treatment of pathologies with mass-effect as it is one of the factors determining a patient's clinical presentation and one of the indicators for surgical intervention. The aim of the study is to develop a computer aided method of evaluating ICV reserve using CT imaging compatible with telemedical networks.

MATERIALS AND METHODS

CT images of 100 patients (age range 40–60) from hospitals within telemedical network diagnosed with intracranial injury were evaluated. Measurements were done using software quantifying the number of voxels corresponding to cerebrospinal fluid (CSF). On chosen scans (3 at basal cisterns level, 3 at pineal level) specified regions were analyzed: total cerebral surface at basal cisterns level (TC1), pineal level (TC2) and ambient cistern (AC) bilaterally. Values for all specified regions were calculated as mean from consecutive scans in series. Obtained values were correlated with patients' Glasgow Coma Scale (GCS) score.

RESULTS

Patients were divided into three groups based on their clinical state: group1: 3–7 pts GCS, group2: 8–12 pts GCS and group3: 13–15 pts GCS. Values of CSF volume at different levels showed significant differences between the distinguished groups: TC1: 0.470,1.690 and 4.397 ml CSF/scan in group1, 2 and 3 respectively. Statistical analysis showed an inversely proportional relationship between patients' clinical state and CSF volume.

CONCLUSIONS

Obtained results have shown that the assessment of CSF volume expressed in ml CSF/scan can be done using routine CT imaging with the aid of computer quantification software. Basing on numerical data the method, together with clinical presentation, may be used as an objective way of assessing patients in long distance teleconsultations. The authors suggest, however, that there is a need for confronting the results with invasive ICP monitoring.

## Degenerative diseases of the brain

## PO3:31

### ABNORMAL METABOLIC CONCENTRATIONS IN PATIENTS WITH MILD COGNITIVE IMPAIRMENT (MCI): 1H-MRS STUDY

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BACKGROUND

Cognitive and memory impairment are very common problems in elderly patients. Mild cognitive impairment (MCI) is known as a transitional clinical state between normal aging and dementia. In some cases MCI may be a precursor to Alzheimer disease (AD). Early neuronal loss and metabolic changes have been documented in previous studies in AD patients in some "strategic" regions of the brain, mainly in hippocampal formation.

Our goal was to determine whether there are statistically significant changes in hippocampal N-acetylaspartate (NAA), choline (Cho) and myoinositol (mI) levels obtained by single-voxel spectroscopy in MCI patients and normal aging and to evaluate its clinical diagnostic utility.

METHODS

30 patients with MCI and 15 cognitively normal elderly subjects underwent proton MR spectroscopy at 1,5 T system. MR spectra were obtained from anterior and posterior part of hippocampal formation bilaterally, using the point-resolved spectroscopy sequence. Metabolite ratios of NAA/H2O, Cho/H2O and mI/H2O were calculated from the peak height measurements.

RESULTS

Relative to the control group, patients with MCI demonstrated elevated mI/H2O and Cho/H2O ratios in both hippocampal formations. The most significant increase was observed in mI/H2O ratio in anterior part of left hippocampus and in Cho/H2O ratio in posterior part of right hippocampus, in MCI patients vs. cognitively normal elderly. There were no significant differences between mean NAA/H2O ratios measured in hippocampal formation in both groups.

CONCLUSIONS

Proton MRS may be used as valuable additional tool in the evaluation of regional metabolic changes in patients with MCI. Increase of mI and Cho levels in hippocampal formation may be an early sign of cognitive impairment in elderly subjects that can be measured using MRS.

Keywords

mild cognitive impairment

Alzheimer's disease

proton magnetic resonance spectroscopy

metabolites

## PO3:32

### DIFFUSION TENSOR IMAGING OF NORMAL CEREBELLAR WHITE MATTER AND CORRELATION WITH DIFFERENT SUBTYPES OF ATAXIA

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PURPOSE

Diffusion tensor imaging (DTI) color mapping and fiber tractography has been used to study the white matter of the brainstem and cerebellum depicting the afferent and efferent tracts between these two structures. This information combined with structural MR imaging has proven useful in the early detection of impaired cerebellar circuits. We review DTI imaging of the normal cerebellar white matter and characteristic patterns in different subtypes of ataxia.

METHODS

We reviewed structural MR imaging and DTI color mapping and fiber tractography of the normal cerebellar white matter and correlated it with DTI imaging in patients with different clinically proven subtypes of ataxia including multisystem atrophy(MSA), spinocerebellar ataxia (SCA), Freidreich ataxia, Dentato-Rubro Pallido-Luysian atrophy and Progressive Supra-nuclear palsy (PSP).

RESULTS

DTI imaging with color mapping and fiber tractography can be used to map the normal anatomy of the cerebellar white matter and the orientation of the fiber bundles. MSA showed decreased FA in the transverse pontine fiber and middle cerebellar peduncle. PSP showed decreased FA in the superior cerebellar peduncle decussation and superior cerebellar peduncle. FA change in SCA is variable. The different DTI pattern in specific ataxias is complementary to conventional structural MR identifying reduction of specific cerebellar fibers.

CONCLUSIONS

DTI imaging is very useful in identifying the normal brainstem and cerebellar white matter fiber bundles. Early white matter water-molecule disturbance in the brain-stem and cerebellar fibers in different types of ataxia can be identified by DTI and provide a functional evaluation of the impaired cerebellar circuits. It is a useful tool in the evaluation of the status of white matter fibers and in combination with structural imaging may have a diagnostic value in patients with ataxia.

## PO3:33

### APPARENT DIFFUSION COEFFICIENT FOR QUANTIFICATION OF LOW-GRADE HEPATIC ENCEPHALOPATHY

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PURPOSE

To compare the apparent diffusion coefficient (ADC) with the results of plasma ammonia levels and the results of neuropsychological tests to elucidate the significance of the evaluation of ADC in diagnosing minimal hepatic encephalopathy (HE).

MATERIALS AND METHODS

This study comprised 40 patients with liver cirrhosis and 24 healthy subjects. The ADC was measured in various cerebral regions (putamen, pallidus, thalamus, posterior cingulate, frontal and parietal white matters) between minimal HE patients versus no HE patients or control subjects. Cognitive function was assessed using a combination of trail making A test and digit symbol test.

RESULTS

In cirrhotic patients with minimal HE, mean ADC values were increased significantly in white matter such as the frontal ($P<0.01$) and parietal ($P<0.05$) lobes compared to patients with no HE. Significant correlation of ADC values were found in frontal and parietal white matter with the results of trail making A test and the digit symbol test ($p<0.01$, $P<0.05$).

CONCLUSIONS

ADC is a reliable tool for quantification of low-grade HE and the diagnosis of minimal HE.

## PO3:35

### 1H MRSI REVEALS BRAIN METABOLITE ABNORMALITIES IN UNVERRICHT-LUNDBORG DISEASE

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PURPOSE:

Unverricht-Lundborg disease (ULD), a progressive myoclonic epilepsy type 1, is a rare autosomal recessive neurodegenerative disorder caused by mutations of the cystatin B (CSTB) gene. It is characterized by onset at 6–16 years, stimulus-sensitive myoclonus, tonic-clonic epileptic seizures, and its severity and progression can vary considerably. The purpose of this study was to evaluate brain metabolism of ULD patients by proton ($^1$H) magnetic resonance spectroscopic imaging (MRSI) to provide additional characterization of the disease phenotype and to elucidate its possible mechanisms.

METHODS

18 patients with genetically verified ULD (1 compound heterozygote and 17 homozygote for mutations in CSTB) underwent $^1$H-MRSI and conventional MRI at 1.5T (Siemens Avanto) in addition to comprehensive clinical and neurophysiological studies. For MRSI, 15 mm thick volumes of interest (VOI) were placed through the thalamus and basal ganglia, including surrounding temporoparietal white matter and occipital gray matter (80×80 mm). Water-suppressed spectra with repetition time (TR) of 1,500 ms, and echo times (TE) of 30–270 ms to detect rapidly relaxing metabolites and noninverted lactate, were obtained.

RESULTS

Conventional MRI revealed no focal abnormalities in the patients. Significant increases in multiregional lactate concentrations were observed in both CSF and healthy-appearing brain tissue (n=18). The levels of NAA were also reduced in the thalamus, caudate and/or lentiform nuclei in some patients (n=6). Brain lactate was associated with impaired neurophysiological motor function parameters. (P-values< 0.01–0.03).

CONCLUSIONS

We have observed previously unidentified brain metabolite perturbations in patients with ULD, which bear resemblance to mitochondrial encephalomyelopathies (such as MELAS) and those observed postictally in epilepsy. However, ULD patients are not known to have mitochondrial deficiencies. Reduced NAA is a hallmark of regional neurodegeneration, but increased lactate suggests that cerebral energy metabolism may be affected in ULD through a yet unidentified mechanism.

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## PO3:36

### FOLLOW-UP MR PROTON SPECTROSCOPY IN WILSON'S DISEASE

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PURPOSE

To assess the effectiveness of brain proton magnetic resonance spectroscopy (MRS) in monitoring the chelation therapy in Wilson's disease(WD)patients.

METHODS

During one year we follow clinically and MRS 17 newly diagnosed WD cases. A control group consisted of 15 healthy volunteers (age and sex matched).Single voxel spectra were aquired on 1,5T scaner using PRESS sequences with parameters of 22 and 2000 ms (TE/TR) two times, at the begining and at the end of treatment. Voxels (15×15×15 mm) were located in the center of the right and left globi pallidi. All results were expressed as the metabolite/creatine ratios. Data was analyzed using nonpaired t-test for significance testing;$p<0.005$ indicated a statistically significant difference.

RESULTS

During observation period 6 neurological and 9 hepatic patients improved; 2 neurological patients deteriorated. The pre-treatment MRS analysis showed statistically significant lower level of mI/Cr, NAA/Cr, and higher Lip/Cr in all WD patients with improvement.In patients with hepatic presentation, a significant increase of mI/Cr and

Glx/Cr was observed in second (after one year) MRS. In patients with neurological improvement in follow up MRS NAA/Cr increase was noted. During neurological deterioration, a decrease of Glx/Cr and NAA/CR was seen in contrast to another neurological impaired patient with liver failure exacerbation in whom a decrease of mI/Cr and increase of Glx/Cr was observed

CONCLUSIONS

The alternations of NAA/CR ratio in neurological impaired patients and mI/Cr and Glx/Cr in patients with liver failure could be a sensitive marker of clinical recovery and deterioration in those individuals.Proton MRS is a technique that can be used for the effective monitoring treatment efficacy in WD patients.

## PO3:37

### HIGH-RESOLUTION QUANTITATIVE MAGNETIZATION TRANSFER IMAGING OF BRAIN STRUCTURES USING BALANCED STEADY-STATE FREE PRECESSION – NORMATIVE BASELINE DATA IN HEALTHY ADULTS

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INTRODUCTION

Magnetization transfer (MT) sensitized bSSFP[1]is a new method providing high resolution quantitative MT (qMT) images within reasonable acquisition times. In this study, normative data for cerebral structures were determined in healthy volunteers.

SUBJECTS AND METHODS

12 subjects were studied on a 1.5T scanner. QMT was completed within 30 minutes with 1.3 mm isotropic resolution, including a B1 map, MPRage and 16 MT-sensitized bSSFP sequences using 8 different RF pulses (230 μs-2100 μs) and flip angles (5°-40°). Relaxation times (T1, T2) and MT parameters (fractional pool size: F, exchange rate: kf; and MT ratio: MTR) were evaluated for white mater (WM) and grey matter (GM) structures.

RESULTS

No significant difference between hemispheres was found. Except for the thalamus, MTR was higher in WM than in GM. Except for the pallidum, higher F and kf and lower T1 and T2 were observed in WM compared to GM. Significant correlation ($p<1E-4$) was found within and between relaxation times {T1, T2} and qMT parameters, whereas MTR was uncorrelated to either F or kf.

DISCUSSION

The differences in relaxation times and MT estimates between WM and GM might primarily be attributed to the differences in the microstructure like fiber density, amount of myelin water and composition of extra-and intracellular fluid. The qualitative nature of MTR and the breakdown of a complex phenomenon into a single value are expressed by the lacking correlation between MTR and qMT parameters for both WM and GM.

CONCLUSIONS

QMT provides tissue information that can not be derived from simple MTR or conventional MRI. Our results provide a high resolution normative 3D qMT baseline for the assessment and characterization of cerebral diseases and their clinical evolution.

References

[1]Bieri O and Scheffler K (2007) Magn Reson Med 58:511–518.

## Functional imaging of the CUN

## PO4:38

### APPLICATION OF FUNCTIONAL MRI STUDIES IN PREOPERATIVE DIAGNOSIS OF EPILEPSY

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There are two principal aims of neurosurgical treatment of epilepsy: complete withdrawal or significant reduction of frequency of the seizures and improvement of the health related quality of life of patients and their caregivers. Therefore the main condition for qualification for the surgery was low probability of occurrence of the neurological deficits or increase of the previously existing disturbances caused by the epilepsy. Preoperative diagnoses requires consequently brief and standardised methods and procedures for estimation of CNS activity especially with high validity of measurement, such as fMRI paradigm was assessed. Because of lack of agreement for examination protocol for assessment of the lateralization of mesiotemporal memory function and for the mapping of the activity of these particular areas of temporal lobe which are connected with responsive and confrontation naming, our study was prepared for establish standardised polish language fMRI protocol.

Several fMRI paradigms were prepared consisted of finger tapping, legs motion, words generation, listening of the story. For each patient the individual activation map was calculated using SPM2 and own made softwere which shows the dominant hemisphere as well as eloquent regions. The results were successfully verified with clinical tests and Wada test.

Pilot study involved 20 adult health persons with age ranged from 18 to 35 years without any risk factors for the reorganization of eloquent cortex areas. Study will be continued according to assumptions of the grant KBN (N402 044 32/1354).

## PO4:39

### PARIETAL LOBES' ACTIVITY DUE TO THE CHRONOTYPE AND DIURNAL VARIABILI-TY: FMRI CASE STUDY

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The purpose of the study was to analyze the parietal lobes' activity in a group of subjects representing different chronotypes (extreme morning, intermediate, and extreme evening type). Three healthy volunteers (women, M=34 years) were scanned (Signa Excite GE 1.5T MR system) four times a day (10 am, 2 pm, 6 pm, 10 pm) to consider the diurnal rhythm of neuronal processes. Participants were performing specially designed saccadic task which activated parietal lobes' responsible for attention disengagement process. Functional images were acquired using a spin-echo echoplanar sequence sensitive to blood oxygenation level dependent (BOLD) contrast and analysed using SPM5 package. Classical ReML (residual maximum likelihood) estimation of first level model was done. Conducted research proved that extreme morning type show stronger activation of left parietal lobe while the evening type showed stronger activation of right parietal lobe. The findings show evident differences between subjects' results obtained at different times of day. After several hours of subjects' wakefulness there is a noticeable reduction of the parietal lobes' activity which is not observed in the subsequent measurements. The data is consistent with the decrease of efficiency characteristic for so called post-lunch dip occurring 8–9 hours after usual wakening time. The individual differences in chronotype have an impact on diurnal profile of parietal lobes' activity. For morning type post lunch effect occurs around 2 pm while in the case of evening type around 6pm. The post-lunch dip inhibition of the parietal lobes region activity significantly disables the efficiency of the attention orienting system.

This work was supported by grant from the Polish Ministry of Science and Higher Education (N106 034 31/3110) (2006–2009).

## PO4:40

### OBTAINING TALAIRACH COORDINATES FROM VISUAL AREA CORTICAL MAPS WITH FMRI AND SOME NEUROLOGICAL CONCLUSIONS

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PURPOSE

Functional magnetic resonance imaging (fMRI) gives detailed information of the location of brain activity. Differences in the location of the activation areas were obtained due to the functional-anatomic difference between patients. A solution is the use of a standard brain and Talairach coordinates.

METHODS

The fMRI mapping of visual cortex was performed in 14 healthy volunteers of both sexes, using visual stimulation made of colored circles. The FEEPI and T1–3D images were acquired in Philips Intera 1.5T equipment, and processed using FSL v 4.0.1 software. MNI 152 standard brain was used in the first and second level processing, and Talairach Daemon Client software was used to get the Brodmann area corresponding to Talairach/MNI coordinates.

RESULTS

A combined image of the 14 volunteers fMRI was computed using fMRI second level processing FSL module. The main activation voxel is (16,-93, 7) that corresponds to Brodmann area 17 (primary visual area V1). In addition, other voxels were activated in Brodmann areas 18 (V2; Secondary visual area; (-12,-82,-4)), 44 (52, 9, 22), 45 (54, 39, 4), and 9 (55, 13, 27).

CONCLUSIONS

The results confirm the correlation of the primary visual area (V1) obtained with fMRI and Brodmann area 17 demonstrated only in the Neurophysiology standard books. Other activation areas correspond to V2, and the dorsolateral prefrontal cortex (Brodmann areas 44, 45 and 9) which is responsible for motor planning, organization and regulation. Besides, Brodmann area 44 is responsible for On-line type control of visually guided movements.

## PO4:41

### SIGNIFICANCE OF BRAIN METABOLITE ABNORMALITIES OBTAINED BY 3D MAGNE-TIC RESONANCE SPECTROSCOPIC IMAGING IN PATIENTS WITH HIGH GRADE GLIOBLASTOMA MULTIFORME

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PURPOSE

Magnetic Resonance Spectroscopic Imaging (MRSI) is an advanced non-invasive diagnostic technique, which provides functional information about tissue levels of metabolites. In this study we attempted to find voxels with metabolite abnormalities and correlate them with visually classed enhancement grades using the contrast enhanced T1-weighted images.

METHODS

Patients with newly diagnosed grade IV glioblastoma multiforme (GBM; n=8), were preoperatively examined with MRSI in a 3T whole body scanner (TIM-TRIO, Siemens, Erlangen). Volume of interest was arbitrarily established, based on the abnormalities on T2 and T1 weighted MRI. LCModel was used for quantitative analysis of MR spectra and measurement of metabolite concentrations: total Creatine (tCre), Myo-Inositol (mI), total Choline (Cho), N-acetylaspartate (NAA), CNI (Cho/NAA ratio), which were compared to normal metabolite ranges, obtained by healthy control (n=6). All voxels were classed in two groups according to the CNI values ranging from 0.5–0.75 and>0.75.

RESULTS AND CONCLUSIONS

All metabolite levels inside the examined volume of interest were significantly lower compared to the established normal ranges ($P< 0.05$), probably due to high-grade tumor heterogeneity. Overall average value of CNI was 0.41±0.3, but 10.8% of examined voxels had CNI elevation above 0.75, averaging 1.28±0.4. Voxels with elevated CNIs, representing metabolic alteration, correlated with contrast enhancement grading on conventional MR images.

CONCLUSIONS

It was demonstrated that CNI alterations can point out morphological as well as biochemical changes in brain parenchyma, which may not be observed using solely conventional MRI. Refinement of metabolite and ratio thresholds may improve diagnosis.

Keywords

glioblastoma multiforme

magnetic resonance spectroscopy

choline/N-acetyl aspartate index

## PO4:42

### NEURAL CORRELATES OF TEMPORAL ORDER PERCEPTION: FMRI AND EVENT-RELATED POTENTIALS STUDY

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PURPOSE

to investigate neural basis of time perception, using both fMRI and event-related potentials (ERP) techniques. We concentrated on human sequential abilities, i.e. auditory perception of temporal order (TO).

MATERIALS AND METHODS

14 young volunteers were subjected to ERP (oddball paradigm) and fMRI (block design) tasks. In ERP task, the standard stimulus was either (50% volunteers) a sequence consisted of SHORT (10 ms in duration) and LONG (50 ms) white noise, or (50% volunteers) of LONG and SHORT one. The deviant was LONG-SHORT or SHORT-LONG sequence, respectively. Three different levels of task difficulty were applied, on the basis of the duration of inter-stimulus-interval within each pair. The task was to press a button in response to the deviant sequence and reaction times (RTs) were registered. In fMRI, one button was pressed after one sequence presentation and the other one after the opposite sequence. The control task was to press a button after each sequence.

RESULTS

In ERP task in two easier conditions, P300 wave was observed (a positive deflection typically peaked ca. 300 ms following the stimulus, associated with cognitive processing). Moreover, positive correlations between RTs and P300 parameters (amplitudes or latencies) were found. The preliminary fMRI data showed the bilateral activation in insula, inferior frontal gyrus and inferior parietal lobule, independently of task difficulty level.

CONCLUSIONS

P300 wave is associated with the difficulty level in TO task. Moreover, enumerated brain areas are involved in TO perception.

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## PO4:43

### NEURAL CORRELATES OF PASSIVE AND ACTIVE ATTENTIONAL RESPONSES – ASSESSING THE COMPATIBILITY OF TWO FUNCTIONAL IMAGING METHODS

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The aim of this study was the exploration of the neural correlates of basic attentional processes using two methods of measuring neural activity, EEG and fMRI. The secondary objective was the assessment of the validity of one of the EEG source localization methods.

Twenty volunteers (10 females) took part in the study, they all declared no history of neurological problems.

Each subject received a series of innocuous auditory stimuli with randomly varying interstimulus intervals. Stimuli were presented in one of two conditions defined by instructions to ignore the stimuli (passive attention condition), or requiring them to count the stimuli (active attention condition). In two separate experimental sessions activity of the central nervous system was measured using event-related potentials EEG and event-related functional MRI.

EEG was recorded from 32 scalp sites by means of Ag-AgCl active electrodes (BioSemi Active-Two system) mounted in an elastic electrode cap (Electrocap International) at standard 10–20 system locations spread evenly over the scalp. EEG data were analyzed using BrainVision Analyzer software and LORETA source localization program.

Functional images were acquired using a gradient-echo echoplanar sequence sensitive to blood oxygenation level dependent (BOLD) contrast, with the following parameters: TR=3000 ms, TE=60 ms, FOV=22×22 cm, matrix 96×64. During each functional scanning run, 60 sets of 17 contiguous, 7-mm-thick axial images were acquired parallel to the anterior-posterior commissure plane. Functional data were analyzed using SPM5 software.

Results proved complementarity of both methods. While functional MRI provided information about spatial distribution of activity during active and passive attentional responses, EEG showed dynamical changes in event-related potential changes in millisecond scale. Moreover, the results from functional MRI also improved accuracy of source localization algorithms in EEG.

## PO4:44

### 3T MR SPECTROSCOPY IN DRUG-RESISTANT TEMPORAL LOBE EPILEPSY WITH HIP-POCAMPAL ABNORMALITIES

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INTRODUCTION

3T MR systems allows more accurate anatomical investigations and more precise MRS studies. Proton magnetic resonance spectroscopy (1H-MRS) of hippocampal regions might provide lateralizing informations in the presurgical evaluation of patients with drug-resistant temporal lobe epilepsy (TLE).

METHODS

From December 2005 to March 2008 we performed 3T 1H-MRS (Signa Excite system, GE) on bilateral hippocampal regions in 17 patients (7 males- 10 females, aged from 27 to 50) suffering from intractable TLE associated with mesial temporal sclerosis (MTS). All patients underwent surgery; pathological examination of surgical specimens demonstrated MTS in all cases, with associated cortical dysplasia in some. 1H-MRS spectra were obtained by a PRESS

sequence with TE 35 ms, TR 2000 ms. Data postprocessing was performed using LCModel. The tNAA/Cr, tNAA/Cho, tCho/Cr, mI/Cr, Glx/Cr ratio were calculated and compared with data collected from 12 healthy volunteers. Data from patients versus normal subjects, and data from the affected hippocampus versus the contralateral healthy, one were compared and statistically evaluated (Student's t-test).

RESULTS

Our preliminary analysis shows: a) a statistically significant ($p<0.01$) bilateral reduction of tNAA/Cr in hippocampal regions in patients as compared to normal subjects; b) in all patients a statistically significant increase ($p<0.01$) of the mI/Cr ratio in the affected hippocampus as compared to the contralateral one.

CONCLUSIONS

Our study demonstrates concordance between increased hippocampal mI/Cr ratio and pathological hippocampus; an additional interesting finding was the bilateral reduction of hippocampal NAA/Cr ratio as compared to normals, suggesting metabolic abnormalities in both hippocampi.

## PO4:45

### NEURORADIOLOGICAL FINDINGS IN EPILEPSY PATIENTS WITH HEMISPHERIC SYNDROMES

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OBJECTIVE

To show the neuroradiological findings observed in epileptic patients associated to hemispheric syndromes.

MATHERIAL AND METHODS

There are several diseases that are associated to refractory epilepsy characterized for continuous focal seizures originated in the pathological hemisphere. These diseases are: Rassmussen syndrome; focal sclerodermia with neurological involvement; Perry Romberg syndrome; neurocutaneous syndromes such as Stuger-Weber syndrome and tuberous sclerosis; congenital malformation as hemimegancephaly and migration disorders and residual lesions related to vascular or infection injuries. We review the neuroimaging features of each disease and the usefulness of different neuroimaging technique in the management of these patients.

FINDINGS

Similar neuroradiological findings are observed in some of these disease such as Rassmussen Sd, Perry Rombert Sd. or focal esclerodermia. Differential diagnosis has to be made with congenital infectious or previous vascular injuries. Other diseases such hemimegancephaly or Stuger Weber have very typical findings. Functional studies such fMRI or SISCOM can help to evaluate eloquent areas involved and delimitate the epileptogenic zone.

CONCLUSIONS

Neuroradiological studies are an important tool for identify underlying structural causes in epileptic patients with hemispherical syndromes. Neurofunctional imaging have a essential role in surgery planning and identification of the functional regions involved.

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# Head and neck

## PO5:46

### TRANSARTERIAL ONYX EMBOLIZATION OF A DCSF USING INDIRECT FLOW CON-TROL

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BACKGROUND/PURPOSE

We present the case of a DCSF that was effectively and safely managed employing a single transarterial Onyx® injection under simultaneous indirect flow control.

CASE HISTORY

A 76-year-female with glaucoma presented with a two months duration of mild exophthalmos and chemosis on the right side. Digital subtraction angiography demonstrated a slow-flow Type D fistula in the posterior part of the right cavernous sinus (CS) with supply from the right meningeohypophyseal trunk (MHT) as well as from the right accessory meningeal artery (AMA). The fistula drained anteriorly into the right SOV, and to a lesser degree into the left. No posterior drainage into the inferior petrosal sinus (IPS) or into cortical veins was identified:

A 1.5 F UltraFlow™ microcatheter (MTI, Irvine CA) was navigated into the internal maxillary artery (IMA) over a SilverSpeed™ 0,010 microguidewire (MTI, Irvine CA), and further advanced into the AMA supplying the fistula. A 5F Cordis Envoy™ (Cordis Neurovascular Miami, Lakes, Fl) guiding catheter was introduced from the left femoral artery into the right ICA, and a 20 mm HyperGlide™ balloon catheter (MTI, Irvine CA) to its petrous portion. In order to prevent reflux into the ICA, the balloon was inflated during the slow injection of Onyx® 18 upon its progression and formation of a cast within the CS. The injection was stopped as soon as the cast reached the most proximal part of the right SOV. Control angiograms showed complete occlusion of the fistula. The patients's symptons improved steadily. Her visual acuity improved from 0.1 on both sides to 0.3 in the right and 0.5 in the left eye. The patient was discharged on the fifth postoperative day.

CONCLUSIONS

The use of indirect flow control is a valuable adjunctive technique to increase the safety of transarterial Onyx® embolization, allowing for effective obliteration of a dural cavernous sinus fistula.

## PO5:47

### EXAMINATION OF THE VISUALIZED OF WHITE MATTER TRACTS IN CHANGING ROI SIZE IN DTI TRACTOGRAPHY

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PURPOSE

In recent years, we have great hopes for clinical application of diffusion tensor imaging (DTI) and diffusion tensor tractography (DTT) which enables visualization of white matter tracts using MR systems. Especially, it is said that DTT can visualize of white matter tracts before operation such as a brain tumor in clinical. However, it is known to be different in the visualization of white matter tracts, when various parameters are changed. In this research, we examined the visualization of white matter tracts in changing ROI size.

METHOD

We used a 1.5T MR system (SIGANA HDx; GE) and a brain coil (8 ch high resolution brain coil; MEDRAD). The target was major white matter tracts in a human brain. Parameters were: 128*128; slice thickness 4.0 mm; FOV 26 cm; TR 12,000 ms; TE 84 ms; pulse sequence single shot EPI. We visualized major white matter tracts using DTI tractography software (dTV.‡U; Tokyo University) in changing some kinds of ROI size. And, we calculated the number of fibers and evaluated the atlas of normal anatomy of fibers.

RESULT

There were differences in visualization of each major white matter tracts. When ROI size was big, the number of fibers was great. However, there were many mismatch areas to the target. Oppositely, the atlas of fibers was matched to normal anatomy though the number of fibers was less when ROI size was small. Also, the number of fibers was very less when we set ROI of free hand.

CONCLUSIONS

ROI size greatly effects to the visualization of white matter tracts, so we should carefully set it. Therefore it is very important that we have practices to set ROI matching to the target.

## PO5:48

### MULTIDETECTOR ROW CT OF THE HEAD AND NECK WITH BIPHASIC-CONTRAST INJECTION

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OBJECTIVE

Biphasic contrast media injection would fulfill two contrary requirements of head and neck CT imaging: tumor conspicuity and vessel enhancement. The purpose of this study was to evaluate the value of biphasic injection of contrast material in head and neck CT.

METHODS

A pilot study was performed to generate and to compare time-density curves of monophasic injection (100 ml at 3 ml/sec) and biphasic injection (initially 50 ml at 3 ml/sec and an additional 50 ml administered 35 seconds after initiation of the first injection) of contrast material. In a second study, vessel and parenchyma attenuation was measured in four different protocol groups: monophasic injection (M1), biphasic injection (B1), monophasic injection with a lower injection rate (2 ml/sec) (M2) and biphasic injection with a longer delay time (B2). The measured CT numbers were compared between the four protocol groups using ANOVA. In a third study, the tissue attenuation of two groups- biphasic injection of 80 ml (B3) and a monophasic injection of 100 ml (M3)- was determined.

RESULTS

The vascular attenuation of the B1 was higher than that of the M1 and M2. Despite a longer delay time, the vascular attenuation of the B2 was not significantly different from that of the M1 and M2. There was no significant differentiation of parenchymal attenuation between each group. The vascular and parenchymal attenuation of B3 was not lower than that of the M3.

CONCLUSIONS

The biphasic contrast injection would lead to a significant increase in vascular enhancement and a delay in the optimal scan window.

## PO5:49

### ACUTE CALCIFIC RETROPHARYNGEAL TENDINITIS - A RARE CAUSE OF ACUTE NECK PAIN AND ODYNOPHAGIA

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PURPOSE

To outline the imaging characteristics and clinical presentation of acute calcific retropharyngeal tendinitis, a rare and underrecognized cause of neck pain and odynophagia

METHODS

We describe the case of a 35-year-old female patient who presented with a two-week history of low-grade fever, neck stiffness and odynophagia. Her medical history was otherwise unremarkable.

RESULTS

Clinical observation showed a protrusion of the posterior wall of the pharynx. No other abnormalities were observed. Extensive laboratory investigations were carried out and showed elevated values of C-reactive protein and erythrocyte sedimentation rate. Plain film and CT and of the neck revealed calcification of the longus colli muscle anterior to C1–C2 and prevertebral soft-tissue swelling. The symptoms resolved, without sequelae, within two weeks, under anti-inflammatory and analgesic medications.

CONCLUSIONS

Recognition of the characteristic clinical spectrum and imaging features of this disorder are crucial to rapidly ascertain the diagnosis and thus avoid useless investigations or treatment.

## PO5:50

### IMAGING FEATURES OF NASAL HEMANGIOENDOTHELIOMA: CASE REPORT

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INTRODUCTION

Hemangioendothelioma is a vascular tumor of endothelial origin, histologically intermediate between hemangiomas and angiosarcomas and biologically intermediate in behavior between benign and fully malignant tumors. Involvement of the nose and paranasal sinus is very rare.

CASE REPORT

A 78-year-old female patient with prior history of hypertension was admitted to the emergency department with recurrent epistaxis for the last three weeks. On admission she had anemia (Hemoglobin: 7,6 g/dl) and a nasal tampon was made with a presumptive diagnosis of idiopathic epistaxis. Three weeks later she presented again with severe epistaxis and endoscopic nasal examination revealed a smooth, cyanotic, easily bleeding lesion mass lesion in the right nasal fossa (implantation in nasal septum). Computed Tomography scan with contrast showed an enhancing lesion fulfilling the right nasal fossa. Magnetic resonance imaging (MRI) demonstrated a mass hypointense on T1-weighted images, hyperintense on T2 with flow-voids and strong gadolinium enhancement. Angiography showed a hypervascularized lesion with capillary bed supplied by the right spheno-palatine artery. A pre-surgery selective embolization was tried. Endoscopic resection of the mass was made and pathological specimen showed celular hemangioendothelioma. Immunohistochemical staining for endothelial-related antigens (CD31 and CD34) confirmed the diagnosis. Ten months later the patient remains asymptomatic and there is no endoscopic recurrence.

CONCLUSIONS

Nasal hemangioendothelioma is a rare tumor with unpredictable biological behavior. Diagnosis can only be ma-de by a histopathologic examination and imaging hallmarks are needed. Angiographic selective embolization helps in pre-surgery workup.

## PO5:51

### PARATHYROID LOCALIZATION TEST: OVERVIEW

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PURPOSE

The purpose of this study is to present the overview of the parathyroid localization test.

MATERIALS AND METHODS

We performed various localization tests for the detection and localization of parathyroid tumor in the patients with primary hyperparathyroidism (PHPT) or suspected parathyroid lesion. The novel trend toward focused neck exploration or parathyroidectomy requires precise preoperative localization of the parathyroid tumor in patients with PHPT. Diagnostic modalities for the detection and localization of the parathyroid tumor include nuclear scintigraphy such as planar dual-phase 99 mTc-sestamibi(MIBI) scan, subtraction scan and MIBI SPECT, US, CT, MR, combination studies of MIBI scintigraphy with US or CT, fusion MIBI/CT or SPECT/CT, arteriography and/or venous sampling, intraoperative parathyroid hormone (PTH) testing and intraoperative scintigraphy with gamma probe.

RESULTS

Planar dual-phase MIBI scintigraphy has been used as primary imaging modality of choice as well as radionuclide study of choice. US has been accepted as complementary imaging modality of choice. Likewise, MIBI scintigraphy with US is well known as combination imaging study of choice. CT or MR has been regarded as 2nd complementary imaging modality as well as postoperative imaging study of choice in conjunction with MIBI scintigraphy. Arteriography and/or venous sampling may be supplemented if noninvasive imaging studies are not sufficient. Fusion image of the functional study of MIBI scintigraphy or SPECT and the morphologic study of CT is reported to benefit ectopic adenoma, distorted postoperative neck anatomy and post-thyroidectomy state with no reference of thyroid gland. Intraoperative PTH testing and intraoperative scintigraphy with gamma probe may be used for the intraoperative localization of parathyroid tumor.

CONCLUSIONS

Planar dual-phase MIBI scintigraphy and combination study of MIBI scintigraphy with US or CT have been most commonly used as the imaging study of choice. Fusion planar MIBI/CT or MIBI SPECT/CT may be contributed to better localization in ectopic or distorted lesion.

## PO5:52

### PITFALLS IN HEAD AND NECK LESIONS

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PURPOSE

The purpose of this study is to present and categorize the pitfalls in head and neck regions with cases, for which mistakes were or readily could have been made.

MATERIALS AND METHODS

Every possible pitfall on CT and MRI images in head and neck region which has made mistakes or misinterpretations was categorized.

RESULTS

Pitfalls are largely categorized by missing lesion and pseudolesion causing misinterpretation. First, missing lesion can be led by technical factor, artifact, subtle or small lesion hard to detect, and radiologist with overwork or the deficit of attention, knowledge and experience. Second, pseudolesion induced misinterpretation can be led by normal

structure or variation, minor lesion, technical factor, artifactual lesion and post-treatment change.

CONCLUSIONS

Pitfalls are also unavoidable in head and neck regions, which could make any possible mistakes in daily practice. Misinterpretation or mistake can be overcome by a communication with clinicians to get as much medical information as possible, understanding and correcting pitfalls, and expanding experience and knowledge. Multimodality and follow-up studies are also important.

## PO5:53

### INDICATIONS OF FOLLOW UP FINE NEEDLE ASPIRATION BIOPSY FOR THYROID NODULES: BASED ON INITIAL FINE NEEDLE ASPIRATION BIOPSY RESULTS AND ULTRASONOGRAPHIC FINDINGS

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PURPOSE

To suggest indications of follow up fine needle aspiration biopsy (FNAB) of thyroid nodules based on initial FNAB results and ultrasonographic findings

MATERIALS AND METHODS

287 patients (265 female, 22 male) who went through repeated ultrasonography (US) guided FNAB of thyroid nodules were included in the cohort study. Results of initial FNAB and US findings were classified to five grades. Results of follow up FNAB were analyzed by the grades. The frequency of malignant nodule was evaluated by Kaplan-Meier method and Cox proportional risk model in each grade. The grades of initial FNAB and US findings were divided to simplified high risk and low risk groups. The sensitivity, specificity and accuracy were evaluated as malignant nodules when the patient was the high risk group of initial FNAB or US findings.

RESULTS

Nondiagnostic nodules were 12.8%, benign nodules were 8.2%, and indeterminate nodules were 37.5% of malignant rate in the result of initial FNAB. In US findings, the 3, 4, 5 grades were each 38.6%, 50.0%, and 53.8% of malignant rate. Nondiagnostic and indeterminate nodules of initial FNAB result and 3, 4, 5 grades of US findings were high malignancy rate than others by Kaplan-Meier method and Cox proportional risk model. The malignancy rate of the high risk group was higher than the low risk group when the high risk group included nondiagnostic and indeterminate nodules of initial FNAB and 3, 4, 5 grades of US findings. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 93.3%, 38.4%, 22.0%, 96.9% and 47.0%, respectively when follow up FNAB was performed if nodule was high risk group of initial FNAB or US findings.

CONCLUSIONS

We proposed that follow up FNAB would be performed when thyroid nodule was high possibility to malignant nodule considering previous FNAB result and US findings.

## PO5:54

### IMAGING APPROACH OF HORNER SYNDROME WITH EMPHASIS ON ANATOMICAL LOCATION

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PURPOSE

This exhibit outlines the various pathologic conditions associated with congenital and acquired Horner syndrome. Etiologies include central, preganglionic and postganglionic lesions

APPROACH

Various imaging modalities, such as CT, MRI and MRA, were used to evaluate pathologic processes along the expected course of the sympathetic pathway of the eye and face. Horner syndrome is an uncommon but important clinical entity, representing interruption of the sympathetic pathway to the eye and face. The sympathetic pathway to the eye begins in the central nervous system (ventrolateral hypothalamus), descends through the brainstem and cervical cord terminating at the ciliospinal centre (C8- T2). Preganglionic fibers exits via C8 nerve root to join the superior cervical ganglion. Postganglionic fibers exits the ganglion to form a plexus along the internal carotid artery. The plexus then ascends into the cavernous sinus and follows the ophthalmic division of the trigeminal nerve (V1) to the orbit

FINDINGS

Different types of Horner syndrome have variable clinical features depending on the underlying pathologic process affecting the central, preganlgionic or postganglionic fibers. MR imaging is most helpful in evaluating central and postganglionic lesions, with MRA is essential in suspected vascular lesions. Whereas combined CT scan and MR imaging are important in suspected lesions affecting the brachial plexus and the superior cervical ganglion

CONCLUSIONS

Horner syndrome is usually associated with unique clinical features depending on the anatomic location of the underlying pathologic process. Imaging of the sympathetic pathway according to the symptoms is warranted. Understanding the clinical features of the three types of Horner syndrome assists in localization of the underlying pathologic process and choice of imaging technique for the differential diagnosis of this complex entity

## PO5:55

### AN FMRI VALIDATION STUDY USING INDEPENDENT COMPONENT ANALYSIS (ICA)

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FMRI is a non-invasive method to visualize stimulus processing in the brain. Analysis of acquired data is normally performed using hypothesis-driven analyzing tools. This means that a search is performed over the data to detect signal changes which follow the

experimental paradigm in their temporal course. This search is based on the assumption of a typical signal course induced by stimulation. However, in certain cases the time course of neuronal activity cannot always be predicted. ICA is a data-driven method. This means that an a priori hypothesis about the paradigm's time course is not necessary. ICA might therefore be a useful adjunct in the analysis of fMRI data. The aim of this study was to compare the results of ICA for the detection of cortical signal changes within an fMRI dataset to the results found using a standard, hypothesis-driven method.

Functional images were obtained from 22 volunteers using a 3T MRI scanner. We used an intranasal CO2 event-related stimulation paradigm. Images were analyzed using SPM2 and GIFT. Detected activities were compared between the two methods.

Using the hypothesis-driven analyzing tool we detected activation in brain areas known to be involved following chemical stimulation of the nasal mucosa: orbitofrontal cortex, association cortex. In addition we found activations in areas specific to the processing of painful and aversive stimuli. Activation of these areas could also be shown by analyzing the data with the data-driven model. Our results indicate that ICA is suitable for analyzing fMRI data, of which no a priori hypothesis is known. Using ICA it may be possible to identify cortical activations in fMRI data which do not follow the typical haemodynamic response function.

This Research was supported by Philip Morris USA Inc.

## PO5:56

### ASSESSING THE LANGUAGE LATERALIZATION IN PATIENTS WITH BRAIN TUMORS: COMPARISON OF HYPOTHESIS-AND DATA-DRIVEN FMRI ANALYSIS METHODS

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PURPOSE

To study the effectiveness of different fMRI-BOLD analysis techniques, we compared the commonly-used hypothesis-driven technique, General Linear Model (GLM), with a recently developed data-driven technique based on Independent Component analysis (ICA). We analyzed BOLD data from patients affected by brain tumor, who performed a language-based task. We aimed at statistically assessing differences in language-related lateralization, as estimated by GLM and ICA methods.

METHODS AND MATERIALS

47 patients underwent fMRI with BOLD technique on a 1.5-T magnet during a word-generation and verb-generation block-design paradigm. A control group of 14 healthy volunteers underwent the same fMRI protocol. BOLD data, after conventional preprocessing steps, were analyzed with both GLM and ICA method. For each of them, statistical maps thresholded at $p<0.001$ allowed the selection of activated voxels. A laterality index (LI) was calculated based on the number of voxels in the left and right hemispheres respectively. Results obtained with GLM and ICA were statistically compared using the Student t-test ($p<0.05$).

RESULTS

Patients showed on average a lower degree of hemispheric lateralization (LI: 0.27) to the dominant (left) hemisphere compared to controls (LI: 0.45) ($p=0.012$), likely related to a functional reorganization of language areas in the right cerebral hemisphere. In the patient group ICA analysis revealed a significantly higher degree of language lateralization (LI: 0.46) to the dominant hemisphere compared to GLM ($p=0.002$); no differences between ICA and GLM analysis were observed in the control group.

CONCLUSIONS

In tumour patients reorganization of eloquent areas for speech is represented by a reduced lateralization to the dominant hemisphere. The different degree of lateralization obtained in the patient group using the two different modalities suggests that ICA might be more advisable than GLM in mapping eloquent brain areas, in particular for neurosurgical patients who are reluctant or unable to correctly perform the required task.

## PO5:57

### INTRACRANIAL ROSAI-DORFMAN DISEASE MIMICKING MULTIPLE MENINGIOMAS: A CASE REPORT

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INTRODUCTION

Rosai-Dorfman disease (RDD) is a rare clinicopathologic entity that involves lymphnodes and a variety of extranodal sites. It is of uncertain pathogenesis. Typically affects children and young adults, presenting with bilateral painless cervical lymphadenopathy. Extranodal sites may be involved and occasionally represent the first manifestation of the disease; isolated central nervous system (CNS) manifestations are extremely rare, in particular if purely intraparenchimal lesions, being the commonest imaging findings dural-based extra-axial enhancing masses.

We present a case of intracranial RDD mimicking multiple meningiomas.

CASE REPORT

We report a case of a 57-year-old male presenting with a 6 years history of progressive right visual and hearing loss and tinnitus. Head MR examination revealed multiple, bilateral enhancing extra-axial lesions with dural attachment mimicking meningiomas, also on CT preoperative examination.

The patient underwent surgical treatment of the biggest infratentorial right mass.

The histopathological diagnosis was of intracranial RDD.

A post-postoperative total-body CT examination showed other localizations of the disease (paravertebral dorsal mass, mediastinal lymphnodes and splenomegaly).

CONCLUSIONS

RDD is a rare pathological condition which not needs a surgical treatment.

Intracranial lesions may not be distinguished from meningiomas. On the bases of our experience, in cases of multiple extra-axial lesion is good to keep on mind the possible differential diagnosis for intracranial RDD and eventually propose to the patient further investigations

## PO5:58

### MRI AND CT APPEARANCES OF PRIMARY MALIGNANT MELANOMA OF THE SINONASAL MUCOSA: A REVIEW OF 10 CASES

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PURPOSE

The aim of this study was to evaluate the magnetic resonance imaging (MRI) and the computed tomography (CT) characteristics of primary malignant melanoma of the sinonasal cavity of 10 patients, using a retrospective review of medical records. The images were compared with histopathologic results and with their own past medical history.

METHODS

A retrospective search of the pathology and medical records was performed at the University Hospital of Coimbra in order to identify all cases with sinonasal melanoma. The search retrieved 10 patients with primary melanoma of the sinonasal mucosa diagnosed and treated between January 1997 and March 2008.

The cases were included based on adequate pathologic material confirming the diagnosis, existence of CT and MRI, and documented clinical follow-up.

RESULTS

There was found a total of six amelanotic and four melanotic melanomas. Tumor sites included nasal cavity, and ethmoid, maxillary and frontal sinuses.

The four melanotic melanomas were hyperintense compared to gray matter on T1-weighted images, consistent with the paramagnetic effect of melanin, while all amelanotic melanomas had low signal intensity. On T2-weighted images, all cases of melanotic melanomas were hypointense compared to gray matter, with amelanotic melanomas being isointense. Gadolinium-enhancement imaging was inconstant, varying from mild to moderate in both cases of melanoma.

CONCLUSIONS

Despite the difficulty in diagnosing amelanotic melanoma using MRI, as these have unspecific characteristics, the same does not apply to melanotic, which usually presents areas of T1 hypersignal and T2 hyposignal, suggesting the pathological nature of the lesion.

The variability in MRI signal intensity does not reproduce the histopathologic division in melanotic and amelanotic melanoma. Rather, it is related to the amount of melanin that is present, allowing for an ample spectrum of imagiologic presentation.

As for the CT image, melanomas do not present specific characteristics, but may add specificity to the histopathologic diagnosis predicted with MRI, being also useful for tumor mapping.

## PO5:59

### MR IMAGING FINDINGS OF A CHOROIDAL ANGIOMA IN A PATIENT WITH STURGE-WEBER SYNDROME

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PURPOSE

To present MR imaging findings of a choroidal angioma in a patient with Sturge-Weber syndrome.

METHODS

A 24-year-old female was presented with facial skin lesion. On examination, the lesion was found to be a facial nevus flammeus. The patient was referred to our MR imaging unit with suspected Sturge-Weber syndrome. A brain MR imaging was performed.

RESULTS AND CONCLUSIONS

On MR imaging, gyral calcifications, which appeared as hypointensities on gradient echo T2 images on left temporal and occipital lobes were present. Pial enhancement was also noted on these areas and left choroid plexus was enlarged. Choroidal thickening and marked enhancement was present on left ocular globe. This lesion was thought to be a choroidal angioma and this diagnosis was confirmed on fundoscopic examination.

Eye anomalies are relatively common in Sturge-Weber syndrome. One of these anomalies is choroidal angioma. In this presentation, MR findings are given with relevant information from the literature.

# Infectious disorders of CUN

## PO6:60

### NEUROWHIPPLE: A CASE REPORT

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PURPOSE

Whipple's disease is a rare, multisystemic chronic granulomatous infectious disease, preferentially involving the gastrointestinal system. We present one of the rare cases of Whipple's disease confined to the central nervous system (CNS).

MATERIALS AND METHODS

A 57-year-old caucasian woman presented with gait and limb ataxia and dysarthria, progressively evolving in the last 3 years. She had no systemic complaints. An extensive laboratorial and imaging investigation was performed.

RESULTS

Magnetic resonance imaging (MRI) scan revealed multiple hyperintense confluent lesions on T2 and FLAIR in the brainstem and cerebellum, discretly enhancing after gadolinium administration, with no surrounding edema or mass effect, compatible with a mesenrhombencephalitis. Cerebrospinal fluid (CSF) examination showed a slightly augmented protein level. After extensive investigation, polymerase chain reaction (PCR) was performed and confirmed Tropheryma whippelii DNA in CSF. Further studies excluded involvement of other organs. A 2-week course of parenterally administered ceftriaxone was performed, and orally daily administered cotrimoxazole was initiated thereafter for 1 year with poor initial clinical and image response.

CONCLUSIONS

CNS Whipple's disease has no characteristic imaging features. Lesions tend to predominate in temporal lobes, diencephalic struc-

tures and optic tracts, but involvement of the mesencephalon and rhombencephalon was also described. Whipple's disease should be included in the differential diagnosis of MRI findings compatible with a mesenrhombencephalitis because of the importance of early institution of antibiotic therapy.

## PO6:61

### SPINAL CORD SCHISTOSOMIASIS: A CASE REPORT

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PURPOSE

Schistosomiasis is an endemic infectious disease caused by trematodes. In Brazil, the endemic species is Schistosoma mansoni. The parasite dissemination in the human organism can, in rare cases, reach the central nervous system (CNS). We report a case of Schistosomiasis presenting as CNS infection.

MATERIAL AND METHODS

An 18-year-old brazilien woman, living in Portugal for the past two years, presented with a rapidly progressive medullary cone syndrome. A laboratorial, imaging and neurosurgical investigation was performed.

RESULTS

Magnetic resonance imaging (MRI) scan revealed an intramedullary lesion at L1 level, isointense on T1, heterogeneously hyperintense on T2, irregularly enhancing after gadolinium administration, with intramedullary hypersignal on T2 adjacent to the lesion. Cerebrospinal fluid (CSF) examination showed an augmented protein level and lymphocitosis. A biopsy was performed, which revealed an inflammatory lymphoplasmocitary infiltrate without neoplastic cells. An infectious etiology was considered and the Cercarienhullen Reaction (CHR) was strongly positive, meaning active infectious disease. Further investigation excluded involvement of other organs. Corticotherapy and praziquantel were initiated empirically with total clinical and partial imagiologic regression.

CONCLUSIONS

CNS infection with Schistosoma mansoni is a rare first presentation of the disease. The medullary cone syndrome is the most frequent neurological presentation and implies an imaging evaluation. Schistosomiasis causes a myelopathy which can be reversible when apropriately treated, and this diagnosis should be considered in adequate epidemiological contexts.

## PO6:62

### CEREBRAL WHIPPLE'S DISEASE: A CLINICAL CASE TREATED WITH A NEW LINE OF TREATMENT. MR FINDINGS

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PURPOSE

To describe the utility of MR in the assessment of Whipple's disease (WD) of the brain and to determine the prognostic value of the findings in a patient on a new line of treatment (transfusion–induced immunosuppression).

METHODS

WD is a rare, multisystemic, infectious disease caused by Tropheryma whipplei bacillus. It is usually characterized as a gastrointestinal and rheumatologic disorder. Nervous system involvement has been described in around 10% to 43% of patients. We present an illustrative case considering the clinical situation and the evolution of MR changes from initial evaluation to long-term follow-up, after transfusion–induced immunosuppression therapy.

RESULTS

We report on a case of WD of the brain in a 33-year-old man who was studied for an 8-month period. All studies from this patient were reviewed by two radiologists. The patient had a history of years of evolution, with changes in consciousness, partial disorientation, moderate dysarthria, truncal ataxia and eye movement abnormalities.

After starting treatment with corticosteroids he presented initial clinical and radiological improvement. However, on withdrawal of dexamethasone his situation declined. Treatment was initiated with intravenous immunoglobulins, leading to progressive clinical and neuroimaging improvement. In the MR findings there were multiple nodular enhancing lesions, predominantly in the frontal area and right hemisphere, as well as in the right periatrial region, suggesting a loss of the signal and absence of the lesion after immunosuppressive therapy.

Upon discharge he was conscious, oriented and able to move on his own, with no significant motor or sensory deficit, mild truncal ataxia and a reduction in ocular abnormalities.

CONCLUSIONS

Our study suggests that in addition to the protocol treatment, confirmed WD of the brain can also be treated with immunosuppressant therapy and MR may predict evolution

# Inflammatory and demyelinating diseases

## PO7:63

### MR FEATURES OF VARIOUS METABOLIC ENCEPHALOPATHIES

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BACKGROUND AND PURPOSE

Metabolic encephalopathy denotes to various condition that affect the central nervous system, reulting from alteration of metabolic processes.

Although metabolic encephalopathy is relatively common condition, it is difficult to exact diagnose and treat because of its various causes and clinical manifestations. The purpose of this exhibit is to review and demonstrate the specific MR features of the various metabolic encephalopathies.

MATERIALS AND METHODS

We will present the clinical manifestations and characteristic MR features of the various metabolic encephalopathies, including disturbance of glucose metabolism (hyperglycemic and hypoglycemic encephalopathy), delayed CO intoxication, hepatic encephalopathy, osmotic myelinolysis, vitamin deficiencies, disturbance of copper metabolism and metronidazole-related toxic encephalopathy.

RESULTS

We could classify the significant differences of MR features of various metabolic encephalopathies, according to the common involving sites and MR features.

CONCLUSIONS

Early detection of metabolic encephalopathy is important, because it can be serious, even life-threatening but often reversible. To understand specific MR features of various metabolic encephalopathies will help to the accurate diagnosis and the appropriate management.

## PO7:64

### MULTIPLE SCLEROSIS – UPDATE ON MRI DIAGNOSTIC CRITERIA

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PURPOSE

To critically review the various MR-based diagnostic criteria proposed in the last years.

METHODS

Review of existing data on MR-based criteria used in the diagnostic scheme for MS.

DISCUSSION

Various criteria have been developed to classify focal white matter lesions in patients with a clinically isolated syndrome as suggestive or not of MS. Probably the most relevant are those of Barkhof-Tintoré, which showed higher accuracy and specificity than the previous MRI criteria for predicting conversion to clinically definite MS. Because of this specificity, an international panel on the diagnosis of MS (2001 McDonald criteria) incorporated the Barkhof-Tintoré criteria into their scheme for demonstrating dissemination in space (DIS). Various authors have argued that these criteria are too restrictive, and partially vague and confusing, particularly regarding the role of spinal cord MR imaging. Several studies have examined modifications of the original McDonald criteria. To this purpose, in 2005 an international panel reviewed the progress attained since the original McDonald criteria were developed, and recommended appropriate changes (Polman et al. 2005).

More recently, new criteria have been proposed for DIS based more on the topographic characteristics of T2-weighted lesions than on their number. When applied to a large cohort of CIS patients, these new criteria demonstrated similar (high) specificity and higher sensitivity as compared to the 2001 McDonald criteria for clinically definite MS.

CONCLUSIONS

All evidence-based data published in the last 2 years related to MR-based diagnostic criteria for MS should be taken into account for future potential modifications of these criteria aimed toward optimising the examination in terms of ease, simplicity, and cost.

## PO7:65

### ANOREXIA NERVOSA: REVERSIBLE BRAIN CHANGES IN TWO CLINICAL CASES

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PURPOSE

Anorexia nervosa is a frequent eating disorder among young women in westerner countries. Studies have identified brain changes originated by this condition reversible after weight gain. We present two cases of restricting-type anorexia with brain changes on imaging studies which were partially reversible after weight restoration.

CASE STUDIES

Case 1: 16 year-old female with restrictive-type anorexia nervosa, with Body Mass Index (BMI) of 10,9, hirsute, malnourished and with a history of amenorrhoea. Two months after hospitalization her BMI was 16,8.

Case 2: 15 year-old female, with restrictive-type anorexia nervosa, hospitalized with a BMI of 10, severely malnourished, hirsute and with long standing amenorrhoea. Two months after treatment her BMI had increased to 15,6.

The neurological exam was normal in both cases.

RESULTS

Brain CT and MR studies showed marked enlargement of the ventricles and brain sulci, both of the cerebellum and cerebrum, consistent with diffuse volume loss. There was also significant decrease of fat content in different locations including the intra-orbital compartment with associated enophtalmus in both cases.

CT and MR done at admission in Case 2 additionally showed widespread T2 and FLAIR white matter lesions involving deep white matter and sub-cortical fronto-parietal regions bilaterally.

The 2 months MR imaging studies after weight gain showed significant reduction of the volume loss and increased fat in different compartments, with resolution of enophtalmus in both cases. There was also improvement of the white matter lesions in the second case.

CONCLUSIONS

Neuroimaging studies have identified several structural brain changes originated by this eating disorder, particularly diffuse enlargement of CSF spaces and less frequently white matter signal changes. These changes appear to be reversible with weight gain, proportionally to the extent and duration of the body weight loss. Recent studies have tried to elucidate the pathophysiology behind these changes.

## PO7:66

### DIFFUSION TENSOR IMAGING (DTI) AND MAGNETIC RESONANCE SPECTROSCOPY (MRS) IN A LONG-TERM SURVIVOR HIV-NEGATIVE PATIENT WITH PROGRESSIVE MULTIFOCAL LEUKOENCEPHALOPATHY (PML)

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PURPOSE

PML is a demyelinating disease caused by the JC polyoma virus typically latent until reactivation by an immuno-deficient state. MRI is considered a fundamental tool in patients with suspected PML, especially when CSF-PCR for JC virus is negative. We report a survived histology-confirmed PML patient studied with MRI using DTI and MRS.

PATIENT AND METHODS

A 33-year-old HIV-negative female with acute lymphoblastic leukaemia diagnosed in 2004 was treated with allogeneic haematopoietic stem cell transplantation from her brother. In October 2005 she experienced right hemiparesis and aphasia within 2 months; PCR for JCV DNA was positive on peripheral blood, negative on CSF. Stereotactic cerebral biopsy performed in January 2006 showed typical PML histology. Biopsy tissue PCR was positive for JCV. MRI showed a left frontal lobe demyelinating lesion soon progressing to contralateral frontal lobe, suggestive of PML. The patient became comatose and was treated with risperidone (a 5-HT2A receptor antagonist commonly used as anti-psychotic). After 2 weeks MRI showed an arrest in progression and three months later, when the patient clinically improved, a reduction of MRI abnormalities.

RESULTS

Progressive clinical worsening correlated with restricted diffusion on DTI (decreased FA and avADC values) and heavy increase of Cho, decrease of NAA and lactate peaks appearance on MRS. With clinical improvement DTI showed an increase of avADC; on MRS lactate peak disappeared and Cho returned in normal range. Up to now the patient is fully oriented and emotionally intact; her peripheral blood is free from JCV DNA. The last MR DTI data indicate a persistence of slight alterations with decreased avADC areas.

CONCLUSIONS

DTI can help to functionally evaluate residual brain tissue and to follow repairing phases in survived PML patients while MRS, mostly with lactate and Cho peaks, strictly correlates with clinical severity.

## PO7:67

### COMPUTER AIDED EXTRACTION AND MEASUREMENT OF DEMYELINATION PLA-QUES IN MAGNETIC RESONANCE STUDIES

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PURPOSE

Extraction of Multiple Sclerosis (MS) demyelination plaques in Magnetic Resonance (MR) FLAIR images, with interactive volumetric measurement possibility.

METHODS

First, the axial MR FLAIR images are subjected to automated segmentation. Application software procedures mark the demyelination regions and label the plaques. Next, the results are stored into a database and available for interactive radiological processing in a Computer Aided Diagnosis (CAD) workstation. Using the designed graphical interface, a user is able to point false positives, correct the shape and size of particular lesions, separate individual structures and measure the volume of particular plaques.

RESULTS

The designed processing methods have been employed during the acquisition of a gold standard reference set for an interobserver study. The reference set has later been used during the evaluation of various automated segmentation approaches.

Ten cases of confirmed MS have been randomly selected and examined. The 1×1×3 mm FLAIR sequences (TR=8002 ms, TE=123.5 ms, TI=2000 ms, 46 slices per study) have first been processed in an automated manner, and then subjected to an interactive radiological analysis that yields a MR volume demyelination map.

Combined automatic-interactive procedure has permitted the fine segmentation and measurement to be available to the user without a requirement of manual lesions outlining, and thus has shortened the analysis time.

CONCLUSIONS

Although, the existing automated segmentation methods permit for the estimation of the amount of demyelinated tissue, the exact measurement of particular plaques needs to be performed by a radiologist. The manual plaques extraction is time consuming and infeasible. The interactive processing based on the results of the automated analysis shortens the processing time and provides additional tools, yet maintains the flexibility of manual segmentation.

## PO7:68

### OLIVOPONTOCEREBELLAR ATROPHY DUE TO MULTIPLE SCLEROSIS

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PURPOSE

To present a very rare case of sporadic olivopontocerebellar atrophy (OPCA) possibly in combination with multiple sclerosis.

CASE REPORT

A 48-year old female patient presented with progressive gait instability, dizziness, and serious disorder of balance, especially on the left with 6 year duration. The clinical examination revealed bilateral pyramidal and cerebellar syndrome. The clinical symptoms and signs have been worsening progressively and she is presently confined in a wheel-chair. The laboratory findings including blood testing, electrolytes control, full

immunological survey, antiphospholipid antibodies, anti-â2GP1 IgG, anti-â2GP1 IgM, SACE, neoplasmatic markers, thrombophilia control, B12 and folic acid levels, albumin level and oligoclonic antibodies of the CSF were negative. Urine test, ECG, Holter test and EEG were normal. DNA testing for SCA 1,2,3,6 and 7 became negative.

IMAGING FINDINGS

Brain-MRI (January 2001) demonstrated severe atrophy of the cerebellar hemispheres, vermis and pons, as well as pontine cross-sign, compatible of OPCA. Multiple small, round and ovoid high signal intensity lesions on T2 – weighted images were demonstrated in the periventricular and subcortical white matter; they did not enhance. They were considered to be non-specific findings.

The last brain MRI (October 2007) demonstrated again the pathological signal intensity and volumetric loss in the medulla oblongata (olive), the pons, and the cerebellum, findings consistent with OPCA. The enlargement of the regional subarachnoid space as well as the cerebellar sulci was also evident.

There was an increase in number and size of the periventricular and subcortical lesions of the white matter compared to previous examination, consistent with imaging worsening, findings more indicative of MS.

SUMMARY

According to the above clinical and especially imaging findings, we propose a combination of multiple sclerosis with subsequent olivopontocerebellar atrophy. To the best of our knowledge there has been no correlation in the literature till now between these two pathological entities.

## PO7:69

### THE ROLE OF DTI IN EVALUATING WHITE MATTER IN PATIENTS WITH MULTIPLE SCLEROSIS

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INTRODUCTION

The pathological factors in MS include axonal loss, gliosis, demyelination, remyelination, edema and inflammation. Imaging and clinical findings in MS patients do always correlate. The aim of this study is to question the usage of Diffuse Tensor Imaging (DTI) and Apparent Diffusion Coefficient (ADC) in estimating occult damage in Normal Appearing White Matter (NAWM), damage that is not recognizable with conventional MRI techniques.

MATERIALS AND METHODS

Whole brain Fractional Anisotropy (FA) and ADC maps were acquired in 60 MS patients and 30 healthy sex and age matched controls. The FA and ADC values of three categories of MS lesions (T1 isointense, T1 hypointense and gadolinium enhancing lesions) were compared with the corresponding FA and ADC values of NAWM in patients and white matter (WM) in controls.

RESULTS

Mean FA values were reduced (0.247 SD=0.082) and ADC values increased (10.820×10–10 SD=2.168×10–10) in all categories of MS lesions in comparison with NAWM (FA 0.393 SD=0.104, ADC 7.962×10–10 SD=1.154×10–10) whereas WM in healthy controls had increased mean FA (0.562 SD=0.059) and decreased ADC (7.300×10–10 SD=0.934×10–10) values when compared with NAWM in patients. The degree of decreased FA value and increased ADC values varied accordingly to the MS lesion type and were proportional to the severity of pathological changes.

CONCLUSIONS

The FA and ADC values suggested damaged NAWM of MS patients in our patient cohort, findings that could not be detected with conventional MRI techniques as T2 and FLAIR. Therefore DTI could play a role in the early detection of microscopic damage of WM in MS patients and could be useful as a prognostic factor, in monitoring the course of the disease, as well as, monitoring therapeutic effects.

## PO7:70

### VISTA 3D FLAIR IMPROVES LESION CONSPICUITY IN MULTIPLE SCLEROSIS (MS) AND CLINICALLY ISOLATED SYNDROMES (CIS)

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PURPOSE

The objective of this study was to assess lesion detection and conspicuity using a 3D VISTA FLAIR sequence at 3T for studying patients with CIS and MS. Improvement was based on comparison of signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) with VISTA compared to traditional FLAIR sequence.

METHODS

Four patients with CIS, four patients with MS, one patient with migraines and one patient with age-related small vessel disease underwent imaging in a Philips 3T Achieva MR scanner. The following sequences were analyzed: T2 FLAIR (repetition time (TR) 6684 ms, echo time (TE) 125 ms, inversion time (TI) 2800 ms, 0.68×1.04 mm voxel, 2.5 mm slice). VISTA (TR 8000 ms, TE 327 ms, TI 2400 ms, 1.10×1.11 mm voxel, contiguous slice acquisition). SNR was calculated as mean signal of tissue divided by standard deviation (SD) of noise. The CNR was calculated as mean signal of lesion minus mean signal of tissue divided by SD of noise.

RESULTS

SNR was significantly improved (p=0.043) for VISTA (M=84.98, SD=10.07) over traditional FLAIR (M=76.20, SD=12.69). CNR was also significantly enhanced (p=0.008) with the use of VISTA (M=71.74, SD 20.57) versus traditional FLAIR (M=55.93, SD=11.97).

CONCLUSIONS

VISTA scanning at 3T provides highly detailed, high quality images with acquisition times tolerated by all ten patients. SNR and CNR were significantly improved. The higher lesion conspicuity and increased FOV make this sequence ideal for use in patients with suspected MS or in reassessment of patients with CIS. Similar to traditional FLAIR, bright lesions on VISTA imaging were seen in non-MS patients. More work is planed to assess the relative sensitivity and specificity of VISTA compared to traditional FLAIR.

## PO7:71

### PATHOGENESIS IN A SUSPICIOUS CASE OF ACUTE DISSEMINATED ENCEPHALO-MYELITIS (ADEM) PRESENTING WITH CHARACTERISTIC MRI FINDINGS

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PURPOSE

To investigate the pathogenesis in a suspicious case of acute disseminated encephalomyelitis (ADEM) presenting with rare MRI findings.

CASE AND METHODS

A 26-year-old man developed paraparesis of lower extremities and urinary disturbance, after precedence infection. Several days later, he admitted with somnolence, dysarthria, quadriparesis, hyporeflexia and nuchal rigidity. In laboratory data, peripheral WBCs were elevated. CSF examination revealed protein of 252 mg/dl, pleocytosis (314 /mm$^3$) and myelin basic protein of more than 2000 pg/ml. All of autoantibodies including anti-aquaporin-4 antibody were negative. Neither antivirus antibody nor bacterial propagation was detected. MR images of brain, cervical, thoracic and lumbar regions were examined.

RESULTS

Brain MRI on T2WI showed symmetrical abnormal signs in the bilateral thalami to posterior limbs of the internal capsule and the middle cerebellar peduncles without gadolinium enhancement. Spinal MRI on T2WI showed long lesion through cervical to lumbar spinal cord, which was accentuated in the grey matter, however, the gadolinium enhancement lesions were scattered in the margin of the spinal cord. He was treated with steroid and repetitive high dose intravenous immunoglobulin. The severity of high signal lesions in the brain has apparently improved, but abnormal signals in the spinal cord have remained two months later.

CONCLUSIONS

The clinical history with precedence infection and the result of CSF examination indicated the possibility of ADEM. The differential diagnosis, such as neuromyelitis optica, multiple sclerosis, collagen disease, infectious encephalomyelitis and intoxication, was carefully excluded. We finally diagnosed as having an ADEM. Intracranial lesions may be explainable by demyelination or inflammation related to allergic tissue affinity mechanism because of their reversible and symmetrical characterization. In addition to these processes, congestion and vasogenic edema accompanied with lymphocyte infiltration through the perivascular spaces might be another candidate to explain the pathogenesis in the spinal cord, which is possibly concomitant with focal ischemic changes.

## PO7:72

### THE INTOXICATED CORPUS CALLOSUM: A PATIENT WITH NON-ALCOHOLIC, REVER-SIBLE MARCHIAFAVA-BIGNAMI DISEASE

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PURPOSE

Marchiafava-Bignami disease (MBD) is a rare pathological condition, typically occurring in alcoholic people, characterized by progressive demyelination and necrosis of the corpus callosum. We report MBD in a non-alcoholic patient abusing of psycho-active medications who presented a full clinical and a partial neuroradiological recovery after discontinuation of drugs.

METHODS

a 78-year-old, non-alcoholic, depressed woman who strongly abused psychoactive drugs developed psychotic symptoms, dysarthric speech and symptoms of inter-hemispheric disconnection. MRI was performed at the onset of disease and 4 months after discontinuation of drugs. MRI was done with a 1.5 T scanner including DWI sequences.

RESULTS

MRI revealed abnormal bilateral and symmetric hyperintense signal on FLAIR sequences in the splenium and in the inferior aspect of the body and the genu of the corpus callosum and corresponding regions of increased water diffusivity on DWI; after Gadolinium administration no enhancement was observed. Neuroradiological findings were consistent with MBD. Four months later, the patient presented a full clinical recovery. MRI follow-up examination revealed a moderate decrease (about 40%) of FLAIR signal changes in the corpus callosum and normalization of water diffusivity on DWI.

CONCLUSIONS

The corpus callosum is known to be the target of different exogenous substance such as alcohol and antiepileptic drugs. In light of this "vulnerability" and of the partial regression of the lesions after drug intake regulation, we consider a toxic effect of psycho-active drugs on the corpus callosum as likely. It is impossible to ascertain which of the numerous medications the patient was taking is responsible for callosal toxicity, nevertheless we report that Marchiafava-Bignami disease is a possible complication of psycho-active drug abuse.

## Interventional neuroradiology: brain

### PO8:73

#### STUDY OF CONFORMABILITY OF THE NEW LEO PLUS STENT TO A CURVED VASCULAR MODEL USING FLAT-PANEL CT (DYNACT)

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PURPOSE

In a previous study we assessed the conformability limitations of self-expandable stents to a curved vascular model. The LEO stent showed two adverse mechanics: flattening of the stent midsection and inward crimping of proximal and distal ends. Both are potential sources for technical or clinical complications. We present a follow-up study, in which we evaluate the conformability of a second generation stent (LEO+).

MATERIALS AND METHODS

A 3.5 mm×25 mm LEO + Stent (Balt Extrusion, France) was deployed inside a 3 mm ×10 cm polytetrafluoroethylene (PTFE) tube (vascular model) with a 5 mm opening (aneurysm neck) at its midsection. The PTFE tube was then placed in a styrofoam block and bent at different angles (0 to 150). For each angle, a rotational radiogram was performed using a C-arm angiographic system (Axiom Artis dBA, Siemens Medical Solutions, Forchheim) with the following protocol: 23 s rotations, increment 0.80°, 166 projections, 2480×1920 matrix (2K). Three dimensional reconstructions were performed using a commercially available workstation (Leonardo; Siemens Medical Solutions, Forchheim) and the following mode: manual, minimal voxel size (ranging from 0.065 to 0.087 mm), 512×512 matrix, kernel: bone sharp. Maximum intensity projections (MIP) of 5 mm and 1 mm thickness were used for evaluation of the stent bendings.

RESULTS

The 5 mm MIPs allowed for a complete visualization of the entire stent. Using 1 mm thickness MIPs, a more detailed evaluation of the stent was possible, enabling an "in-stent' view. The LEO+ stent showed symmetric deployment at all degrees of curvature tested without flattening or kinking. The stent retained its round cylindrical shape at all curvatures without inward crimping of its proximal and distal ends.

CONCLUSIONS

Adverse mechanisms of the LEOstent as previously observed in a curved vascular model, could not be documented with the new LEO+ stent, suggesting better conformability to curved or tortuous vasculature due to design improvements.

### PO8:74

#### STRUCTURAL STABILITY OF FLOW WITHIN A CEREBRAL ANEURYSM

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The strength and direction of blood flow into and within a cerebral aneurysm are important issues in developing effective surgical intervention strategies to stabilize the aneurysm. 3D DSA image data of six aneurysms were retrospectively generated from imaging studies done as part of diagnostic evaluations. Data were obtained with C-arm angiographic system (Axiom Artis; Siemens, Medical Systems, Erlangen, Germany). Manual thresholding was performed on these data sets to obtain a clean geometry of the artery, after which these images were then imported into the pre-processing software package Gambit, where the computational grid was constructed conforming to the geometry of the artery. Simulations were then performed using the commercially available fluid dynamics package, Fluent (Fluent, Inc., Lebanon, N.H.).

Analysis of these numerical simulations of flow across the ostium plane of an aneurysm shows that there is virtually no change in the flow structure over the phase of the pulsatile flow cycle. Quasi-permanent regions of flow influx and efflux across the ostium plane exist, separated by a "virtual wall", as shown in the figure below. The flow pattern within the aneurismal sac is like a helical vortex with swirl in two orthogonal cross-sectional planes. The observed flow patterns are found to be generic to different types of aneurysms bifurcation and sidewall. All results suggest that major aspects of the behavior of intracranial hemodynamics can be learned from an analysis of steady, non-pulsatile flow, which is much simpler and faster to simulate than time-dependent, pulsatile flow. This fluid dynamical behavior should prove to be useful in the design and placement of stents, coils and various other interventional flow diverting devices.

### PO8:75

#### FIBROMUSCULAR DYSPLASIA WITH DISSECTING BASILAR ANEURYSM – RECON-STRUCTIVE ENDOVASCULAR TREATMENT

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INTRODUCTION

Fibromuscular dysplasia (FMD) is a segmental vasculopathy of unknown aetiology typically affecting the medium arteries of middle-aged women. Cervicocephalic FMD most frequently involves internal carotid arteries (ICA) and rarely the intra-cranial ones. The association of FMD with sacular aneurisms is well known but dissecting aneurisms of intra-cranial arteries have rarely been described.

Dissecting aneurysms are challenging to manage either surgically or by endovascular techniques and so are classically treated with parent artery occlusion. The development of intracranial auto-expandable stents allowed reconstructive procedures using a single stent, a stent-within-a-stent or a stent plus coiling techniques.

CASE REPORT

We report a 56-year-old female with FMD involving both internal carotids who presents with a subarachnoid haemorrhage due to a ruptured pseudoaneurysm of the basilar artery treated with a combination of self-expandable stent and hydrocoils..

At MR angiography 6 and 12 months later, the treated pseudoaneurysm remained occluded and the basilar artery wide open without any evidence of in-stent stenosis.

DISCUSSION

Dissecting aneurysms of basilar artery presented with subaracnoid hemorrage has never been described in a patient with fibromuscular dysplasia. Prompt treatment is required because of the high risk of rebleeding. The high morbidity predicted to parent vessel sacrifice made the use of a reconstructive technique advisable. In this regard, coiling above the stent is the most successful technique. Despite the good angiographic results using this technique, a high rate of recurrence of dissecting aneurysm was noted, necessitating a close follow-up. This problem might be overcome with the use of new bioactive coils providing a denser packing of the aneurysm and eventually promoting a neointimal formation across the neck of the aneurysm, thus decreasing the rate of recanalization.

## PO8:76

### VALUE OF DIFFUSION-WEIGHTED IMAGING AND CEREBRAL OXIMETRY DURING STENTING FOR TREATMENT OF WIDE-NECKED ANEURYSMS

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PURPOSE

We evaluated the value of diffusion-weighted magnetic resonance imaging (DWI-MRI) and cerebral oximetry in detection of vascular problems during artery stenting for treatment of wide-necked aneurysms

METHODS

In 30 patients 30 wide-necked intracranial aneurysms were treated with stent and coils implantation. In all patients cerebral oximetry was performed during the procedure. DWI-MRI of the brain was performed before and 24 hr after the procedure.

RESULTS

Two of 30 patients showed new ipsilateral cerebral lesions. Cerebral oximetry did not show significant changes.

DISCUSSION

The role of carotid stenting remains an unproven therapy with some potential benefits in patients at high risk from an open surgical approach. The thromboembolic problem associated with stenting has been reduced using antiplaquet treatment, but the ultimate effect of theses protection treatment remains uncertain.

DW-MRI of the cerebrum is the most sensitive diagnostic procedure in the recognition of cerebral ischemia. After two of 30 procedures new ipsilateral cerebral lesions were seen on DW-MRI. These lesions are the result of microemboli that were released during the procedure. We did not observe neurologic events in relation with new lesions.

In our study DW-MRI indicates that some distal embolization occurred during the protected procedure.

CONCLUSIONS

The antiplaquet treatment is feasible in most cases and the thromboembolic problems associated with stenting has been reduced with protection devices. The routine use antiplaquet treatment during stenting should be considered.

## PO8:77

### INITIAL CLINICAL EXPERIENCE WITH A NEW SELF-EXPANDING STENT: LEO PLUS STENT

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PURPOSE

Stent systems for intracranial use are continuously improved. The Balt Leo Plus stent, is a novel device specifically designed for use in cerebral vessels and is increasingly being used in the embolization of wide-necked aneurysms. We report our initial experience using the Leo plus in the treatment of wide-necked aneurysms evaluating the safety, feasibility and clinical results.

METHODS

Between September 2007 and April 2008, 15 patients with 16 wide-necked aneurysms were treatment with Leo Plus stent assistance. The anatomy of the aneurysms and parent vessels, technical details of the procedure, performance of the stent system, and technical and clinical complications were evaluated.

RESULTS

16 stents were successfully deployed. There was one case of intraprocedural thrombus formation that was easily treated with recombinant tissue plasminogen activator. Overlapping stents were placed in one patient. All patients remained neurologically intact and stable following the procedure.

CONCLUSIONS

In this small series, delivered and deployment of the Leo Plus Stent was technically easy. There were no technical complications. The stent was able to be well visualized, could be repositioned if needed.

## PO8:78

### ENDOVASCULAR THERAPY OF A TRAUMATIC BASILAR PSEUDOANEURYSM WITH BASILAR-CAVERNOUS ARTERIORVENOUS FISTULA

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We describe an unusual case of an 18-year-old man patient presenting with a traumatic basilar artery aneurysm associated with a basilar-cavernous fistula. The fistula occurred as the result of an traffic accident.

The patient originally presented in a coma(GCS). Computed tomography of the head demonstrated subarachnoid hemorrhage in the basal cisterns, intraventricular hemorrhage and a isodense mass in the prepontine cistern.A pseudoaneurysm of the basilar artery with a basilar-cavernous sinus arteriovenous fistula was diagnosed using CT, MRI, MRA and angiograpy. The fistula were successfully occluded by endovascular coil embolizaton in two sessions. By 8 months after injury, the patient had made an excellent neurological recovery, but remained a left hemiparesis and diplopia.

Endovascular coil embolization provided an effective treatment option in the case of this complex and unusual arteriovenous fistula.

## PO8:79

### SUPERIOR LONGITUDINAL SINUS DURAL ARTERIAL-VENOUS MALFORMATION THE-RAPY – AN UNUSUAL TECHNIQUE

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PURPOSE

The venous approach on the treatment of dural arterial-venous malformations (DAVMs) is a well known technique. It's most commonly used on the lateral/sigmoid and cavernous sinus.

We present a case report of a superior longitudinal sinus (SLS) DAVM which was totally excluded with coils through a venous approach.

METHODS AND RESULTS

A 74 years old male patient, with a past history of high blood pressure, diabetes and progressive dementia, was admitted on the emergency department after the onset of left side focal motor seizures. The CT and MRI showed a parietal hematoma on the right hemisphere. A DSA was performed and revealed a SLS DAVM with a multitude of shunts from the meningeal, superficial temporal, tentorial and occipital arteries. There was a functional exclusion of the SLS with a consequent venous drainage through the cortical veins and deep venous system.

We performed a multisession coiling of the SLS and obtained a total exclusion of the shunt. The patient suffered no more seizures and there was a significant improvement of his cognitive deficits.

CONCLUSIONS

The option for a venous approach and coiling of the SLS was based on his functional exclusion and on the existence of multiple arterial-venous shunts which precluded an arterial approach.

The successful exclusion of the DAVM and the good clinical outcome of this patient suggests that this technique is a useful option in selected cases of SLS DAVMs.

## PO8:80

### RESOURCE USE AND PATIENT OUTCOME AFTER RUPTURED INTRACRANIAL ANEURYSMS COILING

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PURPOSE

The aim of this study was to analyze the resource use and clinical outcome of patients with ruptured intracranial aneurysms treated by endovascular coiling. This paper describes the comparison between patients treated early and delayed after subarachnoid hemorrhage (SAH).

METHODS

a review of records of 102 consecutive patients with SAH treated by endovascular approach was performed. They were divided into two groups depending on the time of coiling (<or>72 hours after SAH). Outcomes were assessed according to modified Rankin Scale. Variables indicating resource use were length of stay in the Intensive Care Unit (ICU) and the hospital. The differences between these groups were analyzed by nonparametric tests (Chi-square and Mann Whitney U). $P<0.05$ was considered statistically significant.

RESULTS

a total of 102 patients (43 men and 59 women, mean age 56 year) were reviewed. Fifty-eight (57%) patients underwent endovascular treatment within 72 hours of aneurysmal rupture and 44 (43%) patients were treated later (>72 hours). The median lengths of stay in the ICU (6.55 versus 7.37 days) and the hospital (22.13 versus 26.15 days) were statistically significantly different ($P<0.05$). No differences were found between the two groups with respect to clinical outcome and mortality rate ($P>0.05$).

CONCLUSIONS

in our study, the time of coiling after SAH affects resource use, with shorter length of ICU and hospital stay when treatment is carried out early after the hemorrhage, but it does not seem to affect patient clinical outcome.

## PO8:81

### STENT-ASSISTED COLILING OF CEREBRAL ANEURYSMS. IMPLANTATION OF 7 IN-TRACRANIAL CLOSED-CELL NITINOL STENT (LEO). INITIAL REPORT

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Endovascular elimination of an aneurysm from cerebral circulation with detachable coils is an often used procedure to protect patient from subarachnoid haemorrhage. In most cases this method is rather easy to perform. Main difficulties which can take place during the procedure are: impossibility to reach an aneurysm with mikrocatheter and impossibility to put coil into aneurismal sack because of wide connection with parent artery. Until now, temporary occlusion of aneurysm with undetachable balloon during coiling was done. This method has limitations because after removing the balloon coils can prolapse from an aneurrysm. Currently intracranial stents which can hold coils in an aneurysm are introduced. In Institute of Psychiatry and Neurology in Warsaw 7 implantations of intracranial stents as first step of embolization of an aneurysm were conducted.

MATERIAL

7 patients with one or more cerebral aneurysm.

METHOD

Stent Leo or Leo Plus made of braided nitinol wires, with 2 highly radiopaques wires that ensure visibility of both diameter and length was used.

RESULTS

In 6 cases stent was implanted in right position and covered whole neck of the aneurysm. In 1 case stent didn't completely covered the whole neck of the aneurysm. In one case stent eliminated aneurysm from cerebral circulation. There were no clinical or angiographic complications.

CONCLUSIONS

Implantation of intracranial stent can be supporting or final method during endovascular eliminating of an aneurysm from cerebral circulation. Implantation of stent in aneurysm with very wide neck can create problems.

## PO8:82

### ATYPICAL DEVELOPMENTAL VENOUS ANOMALY ASSOCIATED WITH ARTERIOVE-NOUS FISTULA AND INTRACEREBRAL HEMORRHAGE: A CASE DEMONSTRATED BY SUPERSELECTIVE ANGIOGRAPHY

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This is to report an unusual case of DVA and to review relevant literature.

A case is presented in which a developmental venous anomaly (DVA) was adjacent to a large acute intracerebral hematoma. Selective angiography showed an arteriovenous shunting supplied by an arterial feeder, draining into the DVA. Superselective angiography clearly demostrated a single AVF with drainage into the DVA in the arterial phase. After glue embolization of the AVF, early venous drainage was disappeared and DVA was visualized only in the venous phase during control angiography.

This case is, to our knowledge, the first angiographic presentation showing a DVA associated with an AVF. A review of the literature id provided to discuss the nature of the DVA and associated vascular lesions.

## PO8:83

### DETERMINING THE PROPER FIRST COIL LENGTH FOR COMPLETE FRAMEWORK DU-RING COIL EMBOLIZATION OF CEREBRAL ANEURYSMS USING VOLUMETRY OF ANEURYSMS AND PACKING DENSITY

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PURPOSE

In aneurysms with complex shapes, determining proper length of first coil is very important for making complete framework. The aim of this study is to investigate proper first coil length for complete framework using coil packing density and aneurysm volumetry

METHODS

This retrospective analysis in 85 patients was performed to evaluate proper first coil length on intracranial aneurysms embolized using detachable coils using volumetry. Aneurysms were classified according to size and shape. Most of wall, dome, and neck of the aneurysm covered by the coil loops were interpreted as complete framework. Incomplete framework means that uncovered wall and dome or neck of the aneurysm are remained. Degree of framework was evaluated with the nonsubtracted anteroposterior and lateral view after first coiling. The first coil packing density was expressed as (first coil volume/aneurysmal volume) × 100(%).

RESULTS

Complete framework was 58 of 85 cases. Tiny aneurysms were 34 of 58 cases with complete framework. Small aneurysms were 23 of 58 cases. There was one large aneurysm of 58 cases with complete framework. Incomplete framework was 27 cases. Tiny aneurysms were 10 of 27 cases with incomplete framework. Small aneurysms were 12 of 27 cases. 5 cases with large aneurysm showed incomplete framework. Average first coil density of tiny aneurysms was 11.5% in 34 cases with complete framework. Average first coil density of small aneurysms was 8.5% in 23 cases with complete framework. Average first coil density with incomplete framework was 5.3% in small aneurysms. Average first coil density of tiny aneurysms was 8.7% in 10 cases with incomplete framework.

CONCLUSIONS

First coil packing density for complete framework is over than 8.5% in small aneurysms and over than 11.5% in tiny aneurysms.

## PO8:84

### GLUE TREATMENT OF IATROGENIC ARTERIAL PERFORATIONS DURING EMBOLIZATION OF INTRACRANIAL ARTERIOVENOUS MALFORMATIONS AND FISTULAS

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PURPOSE

We aimed to present glue treatment of arterial perforations occuring during endovascular embolization of intracranial arteriovenous malformations (AVM) and fistulas (AVF).

MATERIALS AND METHODS

In six (25%) of 24 patients, 8 (6.5) arterial perforations occurred during 123 intracranial AVM nidus or AVF microcatheter manipulations of 45 sessions. They were 10 women and 14 men (mean age: 37.0 years). Of 24 patients, 21 were AVM and 3 were AVF. In all patients, onyx was planned for embolization. Glue (cyanoacrylate) with 25% concentration was prepared to use for occluding the perforated artery before starting the catheterization. In every suspect of arterial perforation, control angiography was performed to define the extravasation.

RESULTS

In all patients, succesful management of arterial perforation with glue injection was obtained. No serious early or late complication was seen after the procedure due to subarachnoid hemorrhage or occluding the vessel.

CONCLUSIONS

Glue injection for the treatment of arterial perforations during microcatheter manipulations of intracranial AVM or AVF embolization is a safe and effective method.

## PO8:85

### SIMULTANEOUS ENDOVASCULAR EMBOLIZATION OF MULTIPLE INTRACRANIAL ANEURYSMS

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PURPOSE

We evaluated the safety and effectiveness of simultaneous endovascular embolization of ruptured multiple intracranial aneurysms.

MATERIALS AND METHODS

We treated 10 patients (4 women, 6 men and mean age: 49.0 years) simultaneously with ruptured multiple aneurysms in same session. Of 20 aneurysms, 3 were in the posterior and 17 in the anterior circulation. All patients had two aneurysms and at least one of the aneurysms had ruptured. In one patient, ruptured middle cerebral artery aneurysm was partially clipped. Two patients were operated on for ruptured aneurysm but aneurysms could not be clipped. One patient was embolized about 2 weeks after the unsuccesful operation. The other one was embolized 3 years following operation. The patient was under follow-up by a neurosurgeon. In 3 patients, anerysms were on the same side.

RESULTS

In all patients, succesful embolization of 20 aneurysms except one (5.0%) were obtained. In two patients (20.0%), aneurysm rupture occured during embolization. Succesful embolization was performed in one patient after rupture. But in the other patient, in spite of succesful prevention of bleeding from middle cerebral artery aneurysm, last coil prolapsed into the vessel and anticoagulation was continued. One day later anerysm reruptured, patient was operated on and aneurysm was clipped. Patient recovered with right serious hemiparesia. One patient died after successful parophtalmic and basilar tip aneurysm 2 day later because of basilar and posterior cerebral artery thrombosis. In one patient, cerebral infarction due to vasospasm was progressed after coiling. Remodelling baloon were used during coiling in 18 aneurysms in 9 patients.

CONCLUSIONS

In the treatment of ruptured multiple intracranial aneurysms, simultaneous endovascular embolization can be done effectively in one sesion.

## PO8:86

### SYNCHRONOUS MULTIPLE STENTING AND ANGIOPLASTY OF SUPRAAORTIC STENOSES IN CEREBRAL ISCHEMIA

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PURPOSE

We evaluated the safety and effectiveness of synchronous stenting and balloon angioplasty of multiple supraaortic stenoses in patients with cerebral ischemic symptoms.

METHODS AND MATERIALS

We treated 21 patients with multiple stenoses of supraaortic vessels in 22 sessions. Stenting and balloon angioplasty were performed syncronously in 4 lesions in one (4.8%) patient, 3 lesions in 3 (14.3%) and 2 lesions in 17 (80.9%) patients. Stenting and balloon angioplasty were performed for 50 lesions; 9 in right internal carotid, 15 in left internal carotid, 4 in right common carotid, 7 in left common carotid, 7 in left vertebral, 2 in right subclavian, and 6 in left subclavian arteries. Angioplasty was performed for two lesions only in one patient with left common carotid and left subclavian artery bypass graft stenoses proximally and distally.

RESULTS

Procedures were successful in all lesions (technical success: 100%). Patients were followed for 1–43 months. Death or stroke was not seen during the procedure, in early or late period. In three (14.3%) patients bradycardia and in one (4.8%) patient asystoly relieved with atropine developed during instent baloon dilatation. In two (9.5%) patients, hypotension lasting 2 days was seen. There was no additional embolic lesion on CT and/or MRI performed the following day. In two (9.5%) patients, stent restenosis after 12 months and baypass graft stenoses after 18 months were seen and relieved with balloon angioplasty.

CONCLUSIONS

Synchronous multiple stenting and angioplasty in patients with ischemic symptoms are safe and technically feasible methods in the treatment of supraaortic stenoses.

## PO8:87

### OUR EXPERIENCES IN STENT-SUPPORTED OCCLUSION OF WIDE- NECKED INTRA-CRANIAL ANEURYSMS

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INTRODUCTION

The aim of this study was to evaluate the efficiency of use of self-expandible stents in embolisation of wide-necked aneurysms.

PATIENTS AND METHODS

Since January 2007 to March 2008 we treated 27 patients with wide-necked aneurysms by stent-assisted coil embolisation. Patients ranged in age from 25 to 63 years. There were 23 women and 4 men. There were 30 aneurysms, 14 on ICA, 1 ACoP, 9 on the basilar bifurcation, 3 on the VB junction, 2 on P1 segment of PCA and 1 on PICA. Three patients had two aneurysms, 2 on ICA and one on the basilar artery.

Three patients had an acute SAH before the treatment, while in 6 patients the episode of hemorrhage preceeded the treatment for longer than one year. In 18 patients the aneurysms were diagnosed because of long-standing neurological symptoms or by chance. Embolisation was performed by Matrix and GDC coils (Boston and EV3), and we used as support self expandible stents Neuroform (Boston) of different sizes. In three patients we used two stents: one was the case of the double aneurysm on the basilary tip, while in two patients we needed two stents for remodelling of VB junction.

RESULTS

We did not have problems with introduction and placement of stents. In one patient with basilar aneurysm the thrombosis of the right vertebral artery occurred during the intervention. In one patient with PICA aneurysm we could not realise complete occlusion of the aneurysm. In all other patients the intervention was successful and the aneurysms were completely occluded.

CONCLUSIONS

According to the results from literature and our preliminary results, the use of Neuroform stents has shown as safe and efficious method. For more reliable conclusions we need longer clinical and angiografic follow up.

## Interventional neuroradiology: spine

### PO9:88

### FLUOROSCOPY-GUIDED SACROPLASTY. PREOPERATIVE PLANNING FROM 3D CT

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INTRODUCTION

Osteoporotic sacral insuffeciency fractures are ususally spontaneous or caused by discrete traumas. Plain x-ray films rarely show longitudinal sacral fractures. MRI and CT examinations are necessary to demonstrate these fractures. MRI shows bone edema and CT shows the fracture itself. Planning procedures and effectiveness of sacroplasty in longitudinal sacral fractures are demonstrated. Sacroplasty is in our experience not well known to clinicians and radiologists. Since this procedure usually is more challenging than vertebroplasty, meticulous preparations are needed to save time and reduce unpleasantness of the patients during the procedure.

MATERIAL

Five elderly, osteoporotic patients with intense pelvic and hip pain underwent weeks of inconclusive clinical and radiological diagnostic efforts. Finally MRI showed typical bone edema, and CT demonstrated the fractures in all of them. In four patients bilateral fractures were found.

METHOD

Preprocedural planning based on 3D CT, combining multiplanar reconstruction (MPR) and volume rendering technique (VRT) is shown. The CT dataset was transferred to an advanced workstation (Leonardo/Siemens). The treatment was performed on a biplane digital, angiographic equipment after combining fluoroscopic images with the MPR and VRT images from the workstation in order to obtain exact maps for the entrance into the sacral fractures, without damaging any sensible structures. The trochar was then placed into the fracture along the long axis of the sacrum, paralell to the ileosacralic joint. Filling of the entire fracture site and adjacent bone with ploymethylmethacrylate (PMMA) was then achieved.

RESULTS

All five patients tolerated the treatment well and immediate pain relief was experienced in four of five patients. No complications occured. The good painrelieving effect is permanent in four. The other patient has muscle dystrophia and his pain recurred after one week.

CONCLUSIONS

Osteoporotic insuffeciency fractures is probably relatively little known among clinicians. Sacroplasty using long axis technique yields almost immediate pain relief. Preprocedural planning on an advanced workstation seems important.

### PO9:89

### INTRAOPERATIVE VERTEBROPLASTY ASSOCIATED WITH POSTERIOR CORD DE-COMPRESSION: REPORT OF TWELVE CASES

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AIM

Percutaneous vertebroplasty is an increasingly available tecnique for spine pathology treatment and guarantees good results both on vertebral stabilization and treatment of vertebral pain poorly controlled by pharmacological therapy. Surgical treatment remains the only adequate approach to guarantee cord decompression. We report a series of patients treated with surgical decompression combined with simultaneous intraoperative vertebroplasty.

MATERIALS AND METHODS

In our department we performed intraoperative vertebroplasties with simultaneous surgical cord decompression and vertebral stabilization in twelve patients suffering from different spine pathologies.

Two patients had invasive hemangiomas, six vertebral metastasis and four osteoporotic vertebral fractures.

On all patients the combined approach has been performed at thoracic spine level. All patients had symptoms caused by spinal cord compression.

In all patients we performed decompressive laminectomy, with removal of endocanalar pathology when present.

After surgical identification of vertebral peduncles, we positioned trocar needles (13G) under fluoroscopic guidance and injected PMMA in the vertebral body.

Neurosurgeons performed posterior stabilization only in two cases.

RESULTS AND CONCLUSIONS

Percutaneous vertebroplasty combined with neurosurgical approach permits an adequate cord decompression with mechanical stabilization of vertebral spine immediately after cement injection in the vertebral body and prompt pain relief.

We can not draw conclusion on long term efficacy or complications related to this approach due the short follow-up on our patients.

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## PO9:90

### C5-CERVICAL SPINAL DURAL ARTERIOVENOUS FISTULA PRESENTING WITH CONGESTIVE MYELOPATHY OF THE CONE

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Spinal dural arteriovenous fistulae are the most often encountered spinal vascular malformations and are usually encountered in the lower thoracic region. Cervical spinal dural arteriovenous fistulas are exceedingly rare with only eight cases reported in the literature so far. Typical angiographic findings of spinal dural arteriovenous fistulae include a slow-flow shunt with converging feeders from radiculomeningeal arteries draining via a radicular vein centripetally into perimedullary veins. MRI findings such as cord edema and perimedullary dilated vessels may be used to direct the spinal angiography that is needed to localize and classify the shunt. When the shunt is distant from the pathological imaging findings, the diagnosis may be difficult to establish, especially when the shunt is present at an atypical location such as the cervical spine. We present a case of a 51 year old man, presenting with lower thoracic and conus congestive edema due to a cervical spinal dural arteriovenous fistula that was located at the C5 level. Transarterial embolization with N-butyl cyanoacrylate closed the proximal vein and completely obliterated the fistula. Clinical and imaging follow-up confirmed occlusion of the fistula with improvement in clinical symptoms.

Cervical DAVFs distant from the foramen magnum can be a challenging diagnosis when presenting with symptoms of lower thoracic venous congestion. They have to be differentiated from other vascular lesions, such as radicular AVMs, epidural AVSs and perimedullary AVFs. Surgery and endovascular treatment are both effective in treating these lesions, with the goal of both approaches being the complete occlusion of the shunting zone and the proximal part of the draining vein.

# Intracranial Tumors

## PO10:91

### GLIOMA-LIKE APPEARANCE OF BENIGN MENINGIOMA

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INTRODUCTION

As it is well known from the literaure, the benign meningiomas are tumours of predominantly solid structure and very rarely there are cystic changes on them. They are vascularized depending on the localization from dural ACI branches or ACE branches. Herewith we shall present a case of the benign meningioma with CT and angiographic traits of malignant glioma.

CASE REPORT

A patient, female, 52 years of age, reports to her doctor complaining about psychological changes, headache, overall weakness and sensation of weakness in her left hand over the past three weeks. The CT of endocranium was done and the results showed huge bifrontal expansive lesion in projected image of corpus callosum and in basal ganglia on the right side. This was largely of cystic structure and partly solid. She was hospitalized at the Institute/Department of Neurology and was subjected to DSA of endocranial blood vessels.

The examination indicated to highly ramified network of blood vessels originating from a. pericallosae and a. callosomarginalis bilaterally.

The patient was operated on, the tumour was reduced and pathohystological findings indicated it was a meningeom grade I.

CONSLUSIONS

CT as well as DSA and intrasurgically noticed network of pathological blood vessels originating from ACA bilaterally are indicative of a malignant glioma, whereas the pathohystological analysis of different tumour samples confirms it is the case of falx menigioma grade I.

## PO10:92

### GIANT MESENCEPHALOTHALAMIC PERIVASCULAR SPACES: NEUROIMAGING FINDINGS

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PURROSE

Perivascular spaces (PVSs), are structures filled with interstitial fluid surrounding the path of penetrating vessels. Only rarely they may become enlarged and cause mass effect thus mimicking cystic neoplasms. PVSs dilatation may lead to giant lesions, that may necessitate surgical intervention to relieve mass effect of hydrocephalus. We describe the clinical and radiologic findings in 2 patients with unusual white matter cystic dilatations, corresponding to giant perivascular spaces.

METHODS

The first case is of a 40-year old man who initially presented at the age of 28 years with dizziness and signs of right upper arm numbness and was found to have probable low grade neoplasm.. The second case is about a 10-year old boy who at the age of 8 years presented with headaches and papilledema due to obstructive hydrocephalus.

RESULTS

MRI in the first case demonstrated multiple confluent cystic masses of different size in the pons with signal intensity identical to cerebrospinal fluid in all sequences, which remained unchanged in size and appearance. Follow-up studies (including MR tractography) were stable. In the second case MRI revealed multiple bilateral multilocular clusters of variably sized cysts in the pons, mesencephalus and thalami with associated obstructive hydrocephalus. The patient underwent drainage of the larger cystic lesion. Follow-up studies showed no change in the size of the cysts over 2 years.

CONCLUSIONS

Giant perivascular spaces have characteristic imaging features, evidence of their true benign nature and although they may have associated mass effect, they should not be mistaken for other life-threatening disease.

## PO10:93

### PILOCYTIC ASTROCYTOMAS IN TWO ELDERLY ADULTS

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This is a report of pilocytic astrocytomas in two elderly adults, a 68 yo male and a 71 yo female. Brain CT and MR revealed the presence of well-circumscribed lesions associated with contrast enhancement and minimal surrounding edema. Pathological studies revealed pilocytic astrocytomas. Pilocytic astrocytomas are relatively uncommon tumors found predominantly in the pediatric population. The radiographic features of these cases are characteristic of pilocytic astrocytoma; however, reports of this tumor are extremely rare in the elderly. Considering their age, these lesions could be confused with metastatic tumor or malignant glioma. In this presentation, a review of the literature summarizes the current field of knowledge of adult pilocytic astrocytomas.

## PO10:94

### MR IMAGING PECULIARITIES IN SPORADIC SUPRATENTORIAL HEMANGIOBLASTOMA: REPORT OF TWO CASES

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PURPOSE

Supratentorial hemangioblastoma is rare (5–10% of all hemangioblastomas) and usually occurs in the setting of von-Hippel Lindau disease. The classically described MRI picture of hemangioblastoma is of a cyst with enhancing nodule. We report MR imaging findings in two cases of isolated supratentorial hemangioblastoma not associated with von-Hippel Lindau disease.

METHODS AND RESULTS

Case reports. The patients were two men, aged 60 and 43 years-old. Both presented with a single motor fit and were neurologically intact upon examination. In both cases, MRI disclosed a septated cystic lesion abutting the brain surface. The cyst content was hyperintense on FLAIR, and DWI showed no restriction. In one case, contrast enhancement was seen in the cyst walls. In the other case, there was an enhancing peripheral nodule. In both cases, intracystic enhancing septa and adjacent dural enhancement were observed. MR spectroscopy, performed in one case, revealed increased choline. The patients underwent surgical excision of the lesions. The pathological diagnosis in both cases was hemangioblastoma. Spine MRI was performed, but no synchronous lesions were detected.

CONCLUSIONS

The imaging differential diagnosis included pleomorphic xanthoastrocytoma but, in this case, some nodular enhancement is usually present and the cyst content is isointense to CSF on FLAIR. The absence of restricted water diffusion inside the cyst made a non-tumoral lesion, such as an abscess, very unlikely. Hemangioblastoma should be considered in the differential diagnosis of superficial supratentorial cystic lesions with enhancing walls or peripheral nodule. The presence of septa and adjacent dural enhancement may be additional important clues for a correct diagnosis.

## PO10:95

### THE ROLE OF MR IN THE FOLLOW UP OF RECURRENT GLIOMAS TREATED WITH ANTIANGIOGENIC DRUGS. A PRELIMINARY STUDY

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PURPOSE

Novel therapies open new horizons in the prognosis with brain tumours. The aim of this study was to assess the radiological findings (patterns of response, recurrence and complications)found during the follow up of patients with glial brain tumours treated with antiangiogenic drug.

MATERIAL AND METHODS

A retrospective study of 19 patients treated with antiangiogenic drugs for recurrent brain gliomas(5 anaplastic astrocytomas, 2 anaplastic oligoastrocitomas and 12 glioblastomas)was performed.

Patients were followed up between 59 and 460 days (mean 202 days) after the beginning of the treatment. Each patient underwent a basal and several follow up MRI examinations.SE T1 WI before and after contrast administration, as well as SE T2 WI and FLAIR were obtained on each MRI exam.

Response, progression or pseudoprogression was evaluated according to the size of the enhancing tumour,degree of contrast enhancement

(qualitative analysis),size of the area of diffuse hyperintensity on T2WI and FLAIR images,and new lesions.

RESULTS

4/19 patients showed progression in the first follow-up MRI exam after starting the treatment. Progression was in follow up in 3 out of 4 patients but not in 1 patient where pseudo progression was considered.

15/19 patients showed response in the first exam after treatment: regression of contrast enhancement in 9 out of 15 patients, and decrease in size of the area of diffuse hyperintensity on T2WI and FLAIR images in all of them. 12 of these 15 patients showed progression in follow up (recurrence 49–200 days, mean 132 days).

CONCLUSIONS

New therapies in brain tumours could change the radiological approach to the follow up of brain tumours. Different patterns of response, recurrence OR progression have to be taken into account. We have found some discrepancies in the evolution between contrast enhancement and size on T2 and FLAIR images that could be due to the intrinsic action of antiangiogenic drugs and that must be considered in the follow-up.

## PO10:96

### FMRI AND DTI FOR THE OPTIMIZATION OF NEUROSURGICAL PROCEDURE IN NEO-PLASTIC PATIENTS WITH SOMATOSENSORY DESORDER

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PURPOSE

The characterization of functional and axonal disorder is important in patients with brain damage: functional magnetic resonance (fMRI) and diffusion tensor imaging (DTI) can explain variations in clinical outcomes or cerebral reorganization. In patients with functional disorder the identification of axonal loss and the recruitment of fibres not usually involved in a specific function are the basis for planning a correct pharmacological, surgical or rehabilitative treatment.

METHODS

Data were collected using a General Electric Signa Horizon magnet (1.5 Tesla, 50 mT/m gradients) in nine patients with cerebral lesions in perirolandic region close to eloquent brain cortex. Patients were preoperatively investigated with fMRI (eight) and DTI (six). The stimuli for fMRI studies were selected according to the patient's functional disorders, and with the aid of our previous study mapping somatosensory cortex in nineteen healthy subjects. DTI was used to describe the trajectories of white matter tracts located close to the tumour and to differentiate white matter patterns related to different brain lesion.

RESULTS

fMRI data showed in all cases dislocation and reduction of activated cortical volumes (number of activated voxels) close to the lesion, significantly different both from activation observed in controls and from those evoked in the lesion's contralateral hemisphere ($p<0,05$). DTI and tractography (DTT) analysis showed in patients normal orientation but abnormal anisotropy of fibres surrounding neoplastic lesions, probably indicating an enlargement of extracellular space as in vasogenic edema. Inside the tumour fractional anisotropy and DTT analysis showed deviation and destruction of white matter tracts with low anisotropy and abnormal or indefinable orientation of fibres.

CONCLUSIONS

Localization of eloquent cortical areas and tracking fibre bundle respect to the lesion help to plan the extent of surgical resection, to evaluate the possible effects of the intervention in the single subject and to design a correct pharmacological or/and rehabilitative treatment.

## PO10:97

### PROTEAN MANIFESTATIONS OF PITUITARY ADENOMAS

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PURPOSE

To illustrate protean clinical and imaging manifestations of pituitary adenomas

MATERIALS AND METHOD

Two-hundred pathologically proven pituitary adenomas in our institution (male to female; 78:122, mean age; 43.6 years old) from April 1992 to November 2006 were retrospectively reviewed and analyzed clinically and radiologically from a multifarious perspective. All cases were preoperatively evaluated by 1.5 Tesla MR scanner (slice thickness 3 mm, gap 1 mm). Coronal T1-and T2-weighted images, fat-saturated sagittal T1-weighted images, and post-contrast fat-saturated T1-weighed images were obtained.

RESULTS

Among 200 cases, 111 hormorally functioning adenoma (PRL;51, GH; 45, ACTH;12, TSH;2, FSH;1) and 89 hormorally non-functioning adenomas were observed. Six pituitary adenomas were ectopically located in the extrasellar regions: three in the sphenoid sinus, two in the clivus, and one in the suprasellar region. The intact sella floor, dura, or diaphragm was noted in these cases during surgery. Nine pituitary adenomas were bizarrely located in the sella turtica: three protruded to the sphenoid sinus, three displayed empty sella, two surrounded the normal pituitary gland, and one laterally extended into the left cavernous sinus with almost intact pituitary gland. Six pituitary adenomas displayed calcification: three in the peripherial, one in diffuse, and one in multifocal scattered manner. Diabetes insipidus was preoperatively observed in three pituitary adenomas, in which two presented with pituitary apoplexy. Ten male prolactinomas apparently tended to be larger in size than those of 41 female prolactinomas. An ACTH producing tumor was invisible on MR imaging, however, tumor cells were diffusely observed on histopathological specimen. One prolactinoma displayed massive siderosis. A giant non-functioning adenoma significantly extended to the left temporal lobe without enlargement of the sella turtica and one demonstrated a significant infrasellar extension.

CONCLUSIONS

Awareness of these manifestations would be beneficial to radiologists.

## PO10:98

### A SERIES OF 3 PATIENTS WITH MALIGNANT OPTIC GLIOMA-GBM AND ANAPLASTIC ASTROCYTOMA.

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PURPOSE

Malignant optic glioma is a rare tumor and usually rapidly fatal.

The clinical presentation is non specific and may mimic inflamatory conditins.

This presentation will discuss 3 patients with malignant optic glioma of adulthood with presentation of imaging and clinical followup studies including pathology.

Patient 1:

64 year old male presented with blured vision which progressed rapidly with visual field defects and diebetes insipidus.

On his first MRI study there were enhancing lesions including both prechiasmatic optic nerves, chiasm and right hypothalamus.

He underwent biposy which showed GBM.

Treated By radiosurgery/chemotherapy with significant improvement of imaging studies and visual acquity. still being followed up 18 months post presentation.

Patient 2:

74 year old male with progeressive visual loss first right and then left.

The first MRstudy showed high signal within the right retrobulbar optic nerve with faint enhancement, was treated with high-dose steroids for optic neuritis without clinical improvement. biopsy was performed negative for malignancy.

The patient became blind.3 months later MR showed prechiasmatic bilateral enhancing masses of optic nerves.

A second biopsy showed GBM and was treated with radiation and died 8 months from diagnosis.

Patient 3:

69 year old male patient with right eye visual loss. First MR Showed mild enhancement of right optic nerve, diagnosed with optic neuritis. Due to visual deterioration imaged again, MR showed an enhancing mass in reterobulbar right optic nerve which was biopsied diagnosed as anaplastic astrocytoma.Treated with radiation with clinical / radiological improvement.Lost for followup after 4 years.

CONCLUSIONS

Adult malignant optic nerve glioma is a rare tumor, usually rapidly progressive often fatal.

Classified as anaplastic astrocytoma GBM.Mean age in the literature is 52 and no known association with neurofibromatosis. Presentation is non specific and may mimic optic neuritis both clinically and imaging wise.

Only about 30 cases are reported in the literature and to our knowledge this is the first series patients revealed.

## PO10:99

### RESULTS OF INTRAINDIVIDUAL CROSSOVER STUDIES WITH GADOBENATE DIME-GLUMINE FOR MRI OF THE CNS

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PURPOSE

To evaluate results of 5 completed crossover studies in which patients were given the high relaxivity agent gadobenate dimeglumine (MultiHance) and a comparator gadolinium (Gd) agent for MRI of the CNS.

METHODS

All patients (N=336) underwent 2 separate MR exams within 2–14 days of each other. In a randomized order, all patients received 0.1 mmol/kg of Gd-BOPTA and either Gd-DTPA (N=191), Gd-DTPA-BMA, (N=117), or Gd-DOTA, (N=28). Post-contrast images were qualitatively assessed in a blinded manner. Quantitative region of interest measurements of lesion to normal background brain data were also derived by blinded readers. Statistical evaluation was performed using the Wilcoxon signed rank test to measure study group differences.

RESULTS

Gd-BOPTA resulted in significantly greater ($p<0.05$) lesion-to-brain contrast than comparator agents in all 5 studies. In blinded reader evaluations, a highly significant ($p<0.001$) preference for Gd-BOPTA over the other three gadolinium based contrast agents was noted for lesion detection and global diagnostic preference. In patients with poorly enhancing lesion such as metastases, Gd-BOPTA resulted in the detection of lesions not seen on the comparator exams.

CONCLUSIONS

Combined results from 5 intraindividual studies involving 336 patients showed Gd-BOPTA to be more efficacious compared with equal doses of other gadolinium agents for MRI of the CNS. In general, images produced following administration of Gd-BOPTA demonstrated greater contrast enhancement, provided more diagnostic information, and were highly-significantly preferred by experienced, blinded readers. These findings may be attributed to the approximately 25–30% greater enhancement seen with this agent due to weak binding to serum proteins.

## PO10:100

### NEPHROGENIC SYSTEMIC FIBROSIS: A PROSPECTIVE FOLLOW-UP METHODOLOGY FOR PATIENTS WITH SUSPECT BRAIN TUMORS AND CHRONIC KIDNEY DISEASE

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PURPOSE

In order to screen for the incidence of the development of nephrogenic systemic fibrosis in patients with possible brain tumors and chronic kidney disease, we participated in a multi-center, institutional review board approved study of this at-risk patient population.

METHODS

Patients with a history of brain neoplasms or those with neurologic signs and symptoms suspecting such lesions were screened with a serum creatinine measurement and the estimated glomerular filtration rate (eGFR) was calculated using the modified diet in renal disease calculation. If the patient's eGFR was in the range of 20–59 milliliters/minute/meter squared and a contrast enhance scan was determined to be clinically necessary, informed consent was signed and the patient received 0.1 millimoles/kilogram gadobenate dimeglumine. Patients are subsequently followed up over a two year period of time with telephone calls and office visits in order to evaluate their skin for the development of nephrogenic systemic fibrosis. If necessary, a biopsy will be obtained by a dermatologist.

RESULTS

In this multi-center study there have been no confirmed cases yet of the development of nephrogenic systemic fibrosis. One patient was lost to follow-up and a second died of unrelated causes.

CONCLUSIONS

Prospective evaluation of patients with chronic kidney disease who undergo gadolinium enhanced MRI has not previously been accomplished. The methodologies provided appear to be useful and may serve as a model for other institutions.

## PO10:101

### MENINGEAL INFLAMMATORY MYOFIBROBLASTIC TUMOR: INITIAL AND FOLLOW-UP IMAGING FINDINGS IN TEN PATIENTS

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PURPOSE

To describe the initial and follow-up imaging findings in patients with meningeal inflammatory myofibroblastic tumor (IMT)

MATERIALS AND METHODS

The institutional review board approved this study and waived informed consent. Thirty nine MR images in 10 consecutive patients with pathologically proved meningeal IMT (8 intracranial and 2 intraspinal lesions) were retrospectively evaluated, focusing on the lesion distribution, MR signal intensity (SI), CT attenuation, and contrast enhancement pattern with review of cinical records of the 10 patients.

RESULTS

All 8 intracrainal IMT patients showed localized (n=4) or diffuse (n=4) dural thickening, single (n=4) or multiple (n=4) dural based masses with surrounding edema, leptomeningeal thickening (n=5), and dural venous sinus thrombosis (n=5), and the lesions of mastoid (n=3), orbit (n=2), and facial soft tissue (n=1). Two patients with intraspinal IMTs showed a dural based mass and a segmental dural thickening, respectively. The thickened dura showed low SI on T2 weighted images (9/9), iso SI on T1 weighted images (9/9), high CT attenuation (4/4), and diffuse MR enhancement (9/9). Nonenhancing lesion in the thickened dura was seen in all 4 patients with diffuse intracranial IMTs. Variable recurrences were observed in all 4 patients with diffuse intracranial IMTs, but not in the others.

CONCLUSIONS

Localized or diffuse dural thickening with T2 low SI, T1 iso SI, CT high attenuation, and diffuse dural enhancement appear the characteristic findings of meningeal IMT. The diffuse type has a tendency for recurrence.

## PO10:102

### THE FEASIBILITY OF NON-CONTRAST MR IMAGING PROTOCOL IN ROUTINE BRAIN TUMOR IMAGING: EVALUATION WITH HIGH RESOLUTION SUSCEPTIBILITY-WEIGHTED IMAGING AND APPARENT DIFFUSION COEFFICIENT AT 3 T

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PURPOSE

To evaluate the feasibility of non-contrast MR imaging protocol including high resolution susceptibility-weighted image (SWI) and apparent diffusion coefficient (ADC) in routine brain tumor imaging compared to contrast MR imaging protocol including perfusion-weighted images (PWI) at 3T.

METHOD AND MATERIALS

23 patients with 28 intraaxial tumors underwent high field (3T) MR imaging including SWI, ADC, and PWI. Two experienced neuroradiologists blindly and separately reviewed two MR imaging sessions (non-contrast protocol including SWI and ADC vs contrast protocol including PWI), which were spaced 4 weeks apart to avoid recall bias. Intraclass correlation coefficient was used to determine the levels of interobserver variability. To calculate the diagnostic performance parameters of SWI and ADC, we used a scoring system on the basis of the degree of susceptibility signal and visual ADC scoring. We analyzed quantitative perfusion values (relative cerebral blood volume, rCBV; permeability value, PV) on PWI. Receiver operating characteristic (ROC) curve analyses were performed to determine optimal thresholds for tumor grading.

RESULTS

Interobserver agreement was excellent for two MR imaging sessions (r=0.85–0.96). The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for determination of tumor grading with using SWI were 77.5, 100, 100 and 62%, respectively. With combined SWI and ADC, the sensitivity, specificity, PPV, and NPV were 82.4, 100, 100 and 66.7%, repectively. The optimal threshold values for rCBV and PV provided the sensitivity, specificity, PPV and NPV of 87.2, 100, 100, and 72% and 83.4, 100, 100, and 69.3%, respectively. The ROC curve analyses showed no significant difference of area under the curve between the non-contrast and contrast MR imaging protocols.

CONCLUSIONS

Compared to contrast MR imaging protocol including PWI, the application of a non-contrast MR imaging protocol including SWI and ADC is feasible in the routine evaluation of brain tumors at 3T.

## PO10:103

### TRIGONAL CAVERNOUS ANGIOMA: RADIOLOGIC-CLINICAL- PATHOLOGIC CORRELATION

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PURPOSE

Intraventricular cavernomas are rare. Even more rare are those presenting in the trigone of the lateral ventricles and may present with atypical clinical and imaging findings, mimicking other benign or malignant intraventricular lesions.

CASE REPORT

A 52-year old female presented with visual disturbance, headache and vomiting, symptoms clearly suggestive of intracranial hypertension.

Magnetic Resonance Imaging revealed a 3×3 cm inhomogeneous lesion of the trigone of the right lateral ventricle surrounded by hemosiderin causing low signal intensity, along with temporal horn dilatation and marked perilesional edema.

After administration of Gd-chelate the lesion showed enhancement mainly in its medial aspect.

The patient underwent a postcentral transcortical approach which enabled total excision of the mass.

Histological diagnosis was that of a cavernous angioma.

She had an uneventful recovery and remained free of symptoms at the 18-month follow up.

CONCLUSIONS

Intraventricular cavernous angiomas tend to present with atypical clinical picture, but also atypical imaging. A high index of clinical suspicion is required by the clinician and the neuroradiologist, to avoid any unwarranted procedures on a lesion that, if totally excised, has a very favorable prognosis.

## PO10:104

### PONTINE TUMORS IN CHILDREN

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PURPOSE

Brainstem gliomas constitute about 10–20% of CNS tumors. The most common location is a pons followed by midbrain and medulla. The aim of the study is to evaluate variety of MR images of pontine tumors.

METHODS

MR examinations of 206 children with brain stem tumors were retrospectively reviewed.

122 children (71 girls and 51 boys; mean age 7.9, ranged from 1 3/12 to 17 5/12) with tumors localized only in the pons were analyzed in this paper. MR images were evaluated for location, lesion size, signal intensity, intratumoral cyst, contrast enhancement (degree and pattern). Brainstem tumors associated with NF1, and focal gliomas of the quadrigeminal plate were excluded.

Examinations were performed with 1.5T scanner in SE, FSE, FLAIR sequences in T1, T2-weighted images, in sagittal, axial and coronal planes. Gadolinium was administered obligatory in each case.

RESULTS

In 48 children tumors size were smaller then 75% of the brainstem in the axial plane, $p=0.04$.

Signal intensity in T1-WI was isointense in 22 cases, hiperintense in all T2-weighted images, slightly Intratumoral cysts were seen in 18 patients, $p=0.0016$. Gadolinium enhancement was observed in 60 tumors (slightly homo/heterogenous 46, ring-like 14), $p=0.0001$.

Histopathological results were obtained in 26 patients: astrocytoma anaplasticum 10, glioblastoma multiforme 2, astrocytoma pilocyticum 14.

Five year survival rate was 18%.

CONCLUSIONS

MR images of pontine gliomas are typical in pediatric group of age. No enhanced tumors, smaller then 75%, with the intratumoral cyst showed better prognosis in our group of patients.

## PO10:105

### DELAYED RADIATION NECROSIS OF BRAINSTEM AND TEMPORAL LOBES FOLLOWING RADIOTHERAPY FOR LESIONS IN AND AROUND THE CENTRAL SKULL BASE

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BACKGROUND

Radiation therapy is used to treat a variety of lesions in and around the central skull base. Delayed radiation injury/necrosis is one of the most serious and debilitating side effects of radiation. Radiation necrosis is due to endothelial damage, occlusive vasculopathy and resultant coagulative necrosis. The purpose of this exhibit is to demonstrate some common locations and imaging features of radiation necrosis following radiation therapy for lesions centered in and around the central skull base and will correlate that with radiation isodose curves.

MATERIALS AND METHODS

We will demonstrate imaging features in 7 cases of delayed radiation necrosis developing in patients previously treated for neoplastic lesions in and around central skull base. 2 patients had clivus metastases, one had a clival giant cell reparative granuloma, two patients had nasopharyngeal carcinoma, one had a trigeminal schwannoma and another patient had radiation therapy done for a cavernous sinus hemangioma.

RESULTS

Four patients had injury to the temporal lobe and four patients had changes involving the brainstem (one patient had both temporal lobe and brain stem involvement). Time interval between the radiation therapy and appearance of radiation necrosis was 5–84 months.

MR imaging showed edema involving the medial temporal lobes and adjacent brainstem conforming to the radiation field/port. Post-gadolinium images showed heterogeneous areas of mostly peripheral and ill-defined enhancement appearing as 'spreading wave-front' as well as also showed central areas of necrosis particularly in the temporal lobes. Brainstem lesions mostly showed very superficial linear but slightly fuzzy enhancement around the margins of the primary lesion.

CONCLUSIONS

Recent advances in the delivery of radiation use image guided precision localization to permit delivery of higher doses of radiation to well-defined intracranial targets. However, still there is a risk of radiation damage to the adjacent brain parenchyma particularly for lesions in and around the central skull base.

## PO10:106

### PERFUSION CT IMAGING OF BRAIN TUMOR ANGIOGENESIS

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INTRODUCTION

Evaluation of tumor angiogenesis using in-vivo perfusion imaging techniques can help in predicting tumor grade, prognosis, treatment response and patient survival. The purpose of this electronic scientific exhibit is to review the role of perfusion CT imaging in brain tumors.

MATERIALS AND METHODS

A brief review of CT perfusion technique and post-processing will be done. Role of perfusion CT imaging in brain tumors will be discussed including its use in pre-operative glioma grading, assessment of glioma angiogenesis and differentiating recurrent tumor versus radiation necrosis. We will include examples of perfusion CT maps from our teaching cases. Use of perfusion CT to differentiate tumors from non-neoplastic lesions as well as differentiating between lymphoma and gliomas will also be discussed.

DISCUSSION

Tumor neoangiogenesis is often a significant independent prognostic factor in overall and disease free survival and in-vivo measurement of tumor angiogenesis can help grade tumors. Low grade gliomas demonstrate lower blood volume and permeability as compared to high grade gliomas, as a consequence of their lower microvascular density. Conversely, tumors with more immature vasculature (increased neoangiogensis, microvascular density and microvascular cellular proliferation) demonstrate higher tumor vascular permeability and blood volume. Hence, it is possible to grade brain tumors based on various perfusion parameters, especially tumor blood volume and permeability surface-area product measured using perfusion CT have shown a good correlation with glioma grading. Post treatment use of perfusion CT includes differentiation of radiation necrosis and recurrent tumor, since radiation necrosis demonstrates lower blood volume versus recurrent tumor.

Another utility of perfusion CT is that gliomas demonstrate increased blood volume compared to lymphoma, allowing differentiation of the two disease processes in certain difficult clinical scenarios. Similar principle can also be used to differentiate neoplasms from non-neoplastic disease processes such as tumefactive multiple sclerosis.

## PO10:107

### MR SPECTROSCOPY OF INTRACRANIAL LIPOMA AND HIGH GRADE GLIOMA

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Intracranial lipomas are rare benign congenital malformations. They account for less than 0.5% of all brain tumors and are found mostly incidentally in the midline. MR Spectroscopy of lipid signals in the brain is often associated with necrotic tissue and high malignancy. In patients with a high malignant brain tumor lipid signals at other locations could be due to local infiltration or other metastases. The MR spectrum of lipomas is easily confused with high malignant brain tumors.

We describe a 65 year old patient with a right temporal anaplastic ependymoma with a lipoma that was found coincidental in the quadrigeminal cistern around the rectal sinus. The lipoma was only after revision detected on MRI.

The lipid MR spectroscopy signal of the tumor was different compared to the lipid signal of the lipoma. This spectrum could be compared to another incidentally found lipoma in a healthy volunteer.

Spectroscopic lipid signals in patients with known high malignant brain tumor are mostly found in or near the tumor. When lipid signals are found at locations distant from the tumor, next to infiltration and local metastases, intracranial lipomas should be considered, especially when the lipid signals are located in the midline.

## PO10:108

### POSTERIOR FOSSA MENINGIOMAS: CT AND MR IMAGING CORRELATION WITH HISTOPATHOLOGY

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OBJECTIVE

To evaluate the possible relationship between tumor size, peritumoral edema and area of involvement as seen on CT and MR imaging of posterior fossa meningiomas and their histological type and immunohistochemical detection of Ki-67 proliferative index.

MATERIAL AND METHOD

We retrospectively examined 23 patients with different histological type of meningioma located in posterior fossa. The following data were recorded: age, sex, clinical presentation, CT and MRI findings, the hyperostosis changes in the skull base, area of involvement, treatment, histological type and immunohistochemical detection of Ki-67 proliferative index.

RESULTS

The posterior skull base was involved in 23 patients (19 female and 5 male) with 57 years mean age, by different subtypes of meningioma located in posterior fossa: meningioma type I (n= 17) with Ki-67 proliferative index<1%, meningiomas type II (n= 4) with Ki-67 proliferative index<4–5%, and meningiomas type III, with Ki-67 proliferative index<10%.

The CT and MRI appearances of 23 biopsy/proved posterior fossa meningiomas were evaluated and correlated with their histopathology pattern.

No correlation was found between Ki-67 and age, sex of the patients, their symptomatic tumors and peritumoral edema. There was a weak correlation between Ki-67 proliferative index and the shape and the size of tumors. Tumors with ambiguous brain-tumor interface on MRI had higher Ki-67 proliferative index.

CONCLUSIONS

The posterior fossa meningioma are commonly depicted on CT and MR imaging. The analysis of radiological and histopatological findings can provide useful information for planning the management of patients.

## PO10:109

### COMPARISON OF 1.5 AND 3.0 TESLA MR CISTERNOGRAPHY IN THE PREOPERATIVE EVALUATION OF CRANIAL NERVES IN PATIENTS WITH ACOUSTIC NEURINOMA

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PURPOSE

The aim of this study was to compare high-spatial resolution magnetic resonance (MR) cisternography at 1.5T and 3.0T by evaluating the preoperative detectability of cranial nerves in patients with acoustic neurinoma.

METHODS

We retrospectively reviewed MR cisternography consisted of three different sequences using 3-dimensional (3D) driven equilibrium (DRIVE) and balanced fast-field echo (bFFE) before and after contrast administration. Twelve consecutive patients underwent preoperative evaluation at 1.5T and twenty at 3.0T were included in this study. Among these, six were examined at both 1.5T and 3.0T using contrast-enhanced bFFE for intraindividual comparison. For qualitative comparison, detactability of cranial nerves V-XI were graded on a 3-piont scale. For quantitative intraindividual comparison, the signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) of nerve, tumor, brain, and cerebrospinal fluid (CSF) were evaluated using postcontrast bFFE at both field strengths.

RESULTS

Visualization of nerves in DRIVE and precontrast bFFE at 1.5T and 3.0T rated as equivalent, but of nerves in bony canals were more affected by the susceptibility effect in bFFE at 3.0T. Overall image quality rates of nerves adjacent to tumor in contrast-enhanced bFFE at 3.0T were higher than 1.5T. Brain and CSF SNR showed significant increase at 3.0T of 37% and 54%, respectively, whereas tumor and nerve SNR were not significant. The CNR between nerves and tumor showed significantly higher on postcontrast bFFE at 3.0T.

CONCLUSIONS

With high-spatial resolution MR cisternography at 3.0T, the SNR gain reached the excellent level expected with an even higher CNR increase. 3D DRIVE is superior to the 3D bFFE in the assessment of nerves in the bony structure. Contrast-enhanced 3D bFFE sequences should be used to visualize nerve structures not only in the cistern but also on the tumor surface, but both sequences may be complementary each other.

## PO10:110

### HOW TO RECOGNIZE A LOW-GRADE GLIOMA WITH CONVENTIONAL MR IMAGING ?

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PURPOSE

it seems easy thanks to functional MR imaging- diffusion, perfusion and spectroscopy-to diagnose low-grad glioma. Still it is necessary to be able to profit from it. With conventional imaging, diagnosis can be difficult and errors big.

MATERIALS AND METHODS

using various exams, we re-examined elements of clinical orientation and conventional evidences which ensured the diagnosis precociously.

RESULTS

in front of a focused hyperintensity on conventional T2-weighted MR images, first question, is it a brain glial tumor? A more than 60 year-old patient and an acute clinical presentation eliminate low grade tumour. No mass effect is in favour of scar images. T2*-weighted signal abnormalities or cortical gyriform abnormalities suggest a vascular etiology. A high-signal T1 SE-weighted cortical vein suggests a thrombophlebitis.

Second question: the tumoral grade? The contrast-agent imaging is essential: the tumor enhanced, it is not or no more low-grade tumor. On the contrary, no enhancement of a supposed brain glial tumor in old patient can eliminate the diagnosis of tumour.

CONCLUSIONS

The evidences brought by morphological imaging must strongly suggest the diagnosis and indicate possible complement with functional imaging, without waiting traditional control 3 months later.

## PO10:111

### PERFUSION MRI AND MR SPECTROSCOPY IN DIFFERENTIAING RADIATION NECROSIS FROM RECURRENT TUMOR: PILOT STUDY IN SIRIRAJ HOSPITAL

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OBJECTIVE

To evaluate accuracy of MRS and perfusion MR (pMRI) for implementation to brain tumor treatment and the possibility of in-house soft ware for color-map images of metabolite ratio in identifying tumor area.

MATERIAL and METHOD

The retrospective study was done in 33 patients performed MRS of brain after cytoreduction surgery and/or radiotherapy for evidence of residual or recurrent tumor. The MRS was done with CSI technique and pMRI with dynamic T2*. The MRS data was analyzed by spectrum analysis, and in-house soft ware for color-map images of choline/NAA ratio more than 1.7(Cho/NAA-1.7) and 2(Cho/NAA-2), and {choline + creatine}/NAA ratio more than 2({Cho + Cr}/NAA-2) and 2.5({Cho + Cr}/NAA-2.5). The final outcomes were proven by surgery or by clinical follow up and/or follow up with other imaging modality such as conventional MRI or CT in at least 6 months after the first MRI study.

RESULT

Only 14 cases with complete data were analyzed. There were 5 cases of astrocytoma grade2, one of anaplastic astrocytoma, one of oligodendroglioma, 6 of glioblastoma maltiforme and one of cerebritis. Seven cases were proven of tissue diagnosis by surgery and 7 cases were finalized by clinical follow up and/or follow up imagings. Evidence of residual or recurrent tumor were found in 7 cases and negative in 7 cases. The sensitivity, specificity, positive and negative predictive values and accuracy of spectrum analysis were 71.4%, 100%, 100%, 77.8% and 85.7% respectively. The same diagnostic values for pMRI were 85.7% 100%, 100%, 87.5% and 92.8% respectively. The accuracy of Cho/NAA-1.7, Cho/NAA-2, {Cho + Cr}/NAA-2, {Cho + Cr}/NAA-2.5 were 71.4%, 71.4%, 64.3% and 71.4% respectively.

CONCLUSIONS

Our pilot study implies more accuracy of pMRI and spectral MRS for assessment of residual or recurrent brain tumor after treatment than color-map images of metabolite ratio.

## PO10:112

### COMPARISON OF MR SPECTROSCOPY SIGNAL USING SENSE AND NON SENSE

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PURPOSE

To compare the amplitude and area of the metabolite peak in brain MRS between 2 dimension turbo spectroscopic imaging with and without SENSE

MATERIALS AND METHOD

The study was performed in24patients requested brain MRI for ruling out intracranial lesion.{12cases with brain tumors,12cases for control group}.The MRI was done on 3T Philips Achiva scanner.The imaging protocol included 3D-T1wi/TFE in sagittal plane,T2wi/TSE and T2wi/ FLAIR in axial plane,T2wi/TSE in coronal plane and post gadolinium administration with3D-T1wi TFE in sagittal plane.The MRS technique was2D turbo spectroscopic imaging(TSI)with long TE technique at the selected location Two MRS sequences were performed with the same parameters except for using SENSE or non SENSE technique.The SENSE technique was done with scan time of4.24minutes and8.26minutes for non SENSE.The amplitudes and areas under curve of each metabolite were calculated at normal appearing brain tissue and lesions by using commercial program from the scanner. Statistical significant was predetermined with $p<0.05$ by paired T-test.

RESULT

By using non-SENSE technique, the means amplitude of NAA,Cr, Cho at normal brain and Cho at the lesion areas were higher with strong statistical significance compared with SENSE technique ($p<0.01$).No statistical difference between means amplitude of NAA and Cr at lesions was found.At the border of MRS scanning metrics, all metabolites were not difference between both techniques. When comparing areas under curve of each metabolite, no statistical significant difference was found at normal brain tissue and lesions between both techniques. However,with SENSE technique, each metabolite peak had wider width. So each metabolite peak was more clearly identified by visual analysis with non-SENSE technique.

CONCLUSIONS

In3TMRI with non SENSE each metabolite peak was more clearly to be interpreted by visual analysis with higher amplitude and more narrow width.Although SENSE could reduce the scan time but also reduce somewhat signal to noise ratio.The scan time of SENSE technique should be increased to get more signal intensity.

## PO10:113

### ATYPICAL CLINICAL ONSET OF A GLIOBLASTOMA MULTIFORME WITH EXTENSIVE LEPTOMENINGEAL INFILTRATION. RADIOLOGICAL-PATHOLOGICAL CORRELATION

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PURPOSE

We report the case of an atypical radiological and clinical onset of a glioblastoma multiforme with extensive leptomeningeal infiltration. The close radiological-pathological correlation of the case, which clearly disclosed the significance of the radiological findings is particularly remarked.

METHODS

We report a single case, of a 49-year-oldman who presented with a progressively and severe headache and altered consciousness. Physical examination revealed a progressive aphasia and palpebral pthosis. CT scan was performed. A MRI exam was carried out under the suspicion of subarachnoidal haemorrhage. A biopsy was performed during admission. The patient had a rapidly worsening and died due to tonsilar herniation in a context of intracranial hypertension. Autopsy was performed.

RESULTS

CT scan showed hyperdense areas in the subarachnoidal space, together with a nodular image on the right temporal lobe, adjacent to the cavernous sinus. Subarachnoidal haemorrhage was considered. On

MR an infiltrative subarachnoidal tumor was found with large temporal lobe involvement. Several additional subarachnoidal lesions were found. Intracranial metastasis was considered the most feasible diagnosis. No primary extracranial tumor was found. Partial surgical resection of the cavernous sinus mass was consistent with glioblastoma multiforme. On autopsy an enlarged right temporal lobe with transtentorial herniation was found. A large glioblastoma with subarachnoidal infiltration and multiple distant meningeal metastasis were found. Correlation of images between MRI and autopsy slices were very illustrative of the pattern of tumoral growth.

CONCLUSIONS

Glioblastoma presenting as diffuse leptomeningeal tumor infiltration is an uncommon entity that may be considered when large parenchymatous involment is found. An area of intraparenchymatous disturbance within the context of subarachnoidal infiltration may be due to intraparenchymatous oedema. However, as nicely shown by the present case, the possibility of a primary tumour should also be taken into account.

## PO10:114

### IMAGING FEATURES OF MEDULLOBLASTOMA WITH EXTENSIVE NODULARITY

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PURPOSE

To present imaging features of medulloblastoma with extensive nodularity (MBEN), a rare subtype of medulloblastoma, associated with younger age and better prognosis.

MATERIAL AND METHODS

A 9-month-old girl with macrocephaly and disturbed psychomotor development underwent transfontanel ultrasound (US), computed tomography (CT) and magnetic resonance imaging (MRI) of the brain. In four other children (two boys, two girls), aged 3, 7, 9 and 14 months, MRI was performed. Imaging features of the tumours were analysed. After surgery MBEN was diagnosed.

RESULTS

On US the tumour appeared as an ill-defined hyperechoic mass in the posterior cranial fossa, compressing the aqueduct and 4th ventricle. CT showed irregular hyperdense lesion in the vermis and both cerebellar hemispheres. MRI revealed a homogenous mass with gyriform pattern, signal intensity following that of the cerebellar cortex and strong contrast enhancement after gadolinium administration. Differential diagnosis included dysplastic heterotopic cortex, Lhermitte-Duclos disease, atypical teratoid/rhabdoid tumour (AT/RT), and medulloblastoma (MB). In four other children the signal of the tumours showed inhomogeneity with focal hypointensity on T1WI and hyperintensity on T2WI, corresponding to smaller or bigger cysts within the masses. MRI of the spine did not reveal metastatic deposits in our patients.

CONCLUSIONS

Transfontanel sonografic examination is capable of detection of the posterior fossa tumour as a cause of hydrocephalus and macrocephaly. The mass in a child's posterior cranial fossa that is hyperdense on unenhanced CT and gyriform, nodular, and markedly enhancing on MRI may strongly suggest medulloblastoma with extensive nodularity (MBEN).

## Molecular neuroimaging

## PO11:115

### PROTON MAGNETIC RESONANCE SPECTROSCOPY IN ADULT PATIENTS WITH TOURETTE SYNDRO-ME

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OBJECTIVE

To evaluate subcortical neurotransmission abnormalities in patients with Tourette syndrome (TS) by using proton magnetic resonance spectroscopy method (MRS)

METHODS

We evaluated 15 patients(18–54 y/o) with clinically diagnosed TS. The control group consisted of 17 healthy volunteers (age nad sex matched).All TS patients had MRI and MRS.Single voxel spectra were aquired on a 1,5 T scaner, using PRESS sequences with parameters of 22 and 2000 ms(TE/TR).Voxels (15×15×15 mm) were located in the center of the left and right thalamus and left and right lentiform nucleus.All results were expressed as metabolite/creatine ratios.Data were analyzed using nonpaired t-test for significance testing; $p<0.005$ indicated a statistically significant difference.

RESULTS

Significantly increased Glx/Cr value in both thalami were found in TS group, as compared to normal subjects($p<0.001$).71% (10/14) and 47% (7/15) of TS patients had elevated glutamate/glutamine level in the left and right thalamus respectively.79%(11/14) and 66%(10/15) patinets had inreased level of lipids in the left and right thalamus, respectively. 43%(6/14) patients presented significant increase Lip/Cr ratio in both thalami.There was positive correlation between Lip/Cr and Glx/Cr ratios.Both values were elevated in 60% and 33% patients in the left and right thalamus respectively. In TS group 47% (7/15) patients had elevated Glx/Cr ratio in the right lentiform nucleus.60% and 66% of our patients also showed significantly increased Lip/Cr ratio in left and right lentiform nucleus ($p<0.001$), respectively. NAA levels were not changed in both lentiform nuclei or thalami.

CONCLUSIONS

There were no signs of neuronal loss in both thalami and lentiform nuclei.The increased concentration of glutamate and lipids containing compounds reflects specific pattern of metabolic changes within basal ganglia of TS patients.This may result in disrupted glutamate-mediated thalamo-cortical and thalamo-striatal neurotransmission mechanism and contribute to the pathophysiology of tics.

## Pediatric neuroradiology

### PO12:116

#### CONGENITAL ORBITAL PRIMITIVE NEUROECTODERMAL TUMOR: IMAGING-PATHOLOGIC CORRELATION

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We report an extremely rare case of congenital orbital Primitive Neuroectodermal Tumor (PNET), presented at birth. A newborn was admitted because of an enormous redish left orbital mass, about the size of the face, which caused substantial deformity and remodelling of the orbit with downward and lateral displacement of the globe. Axial CT demonstrated a large orbital soft tissue mass with punctuate foci of calcification, without obvious lipid attenuation. No bony erosion was seen. An orbital MRI followed showing an heterogeneous sharply circumscribed mass with necrotic regions. No vascular flow voids were identified. The optic nerve was affected and had an atrophic appearance. The mass was surgically completely excised and histologically proven to be a Primitive Neuroectodermal Tumor.

### PO12:117

#### FETAL AND NEONATAL BRAIN DIFFUSION-WEIGHTED IMAGING: NORMAL FEATU-RES AND APPLICATIONS IN HYPOXIC-ISCHEMIC INJURY. ILLUSTRATED REVIEW

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PURPOSE

To demonstrate the value of diffusion-weighted imaging (DWI) in fetal and neonatal hypoxic-ischemic (HI) brain injury.

METHODS AND RESULTS

Firstly, we depict normal aspects of brain development on DWI. Then, we present illustrative cases in which DWI and ADC maps increased diagnostic sensitivity and confidence or revealed some prognostic value. ADC measurements were performed in both normal and pathological cases.

CONCLUSIONS

In acute diffuse HI brain injury, DWI is a highly sensitive diagnostic tool, allowing the differentiation between areas of cytotoxic and vasogenic edema, which can be simultaneously present. Pre-wallerian degeneration of the corticospinal tracts, detectable by DWI, is a reliable indicator of poor motor outcome. ADC quantification may be helpful in the discrimination between normal features of brain development and HI lesions.

### PO12:118

#### ACUTE EXCITOTOXIC BRAIN INJURY: DIFFUSION-WEIGHTED MR IMAGING

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PURPOSE

The purpose is to describe and illustrate excitotoxic mechanisms in a diversity of neurologic disorders, using diffusion-weighted MR imaging (DWI) of the brain. An additional objective is to acquaint the neuroradiologist with the pathophysiologic mechanisms of excitotoxic brain injury, including the major concepts of glutamate excitotoxicity in infants and adults.

METHODS

The imaging of both children and adults who presented with acute/chronic neurologic symptoms, and who DWI showed cytotoxic edema was reviewed. The imaging involved conventional MR, DWI and in some patients supplementary imaging with MR spectroscopy was obtained to elucidate the metabolic correlation. DWI was acquired using single-shot echo-planar sequences with b-values of 0, 500 and 1000 s/mm $^2$in three orthogonal gradient directions (x, y, and z). From these data, apparent diffusion coefficient (ADC) maps were computed.

RESULTS

We reviewed, discuss and illustrate excitotoxic mechanism in various neurologic conditions: brain infarction, wallerian degeneration, hypoxic-ischemic encephalopathy, diffus axonal injury, non-accidental pediatric head injury, herpes and Rasmussen encephalitis, hemolitic uremic syndrome, glutaric aciduria type I, nonketotic hyperglicinemia, and methanol intoxication. DWI reflects neurophysiologic changes during acute excitotoxic brain injury, detecting cytotoxic edema characterized by a low ADC. DWI might give information about the severity of tissue injury, and can help predict clinical outcome. Mechanisms involved in acute excitotoxic brain injury(glutamate excitotoxicity) are discussed and classified by: increased release of glutamate, decreased re-uptake of glutamate, leakage of glutamate and impaired glutamate receptor function or structurally similar substance. I t is emphasized that combination of mechanisms vary according to each disease process.

CONCLUSIONS

Glutamate excitotoxicity is the final common pathway in neuronal injury for various seemingly unrelated diseases. DWI is useful in detecting cytotoxic edema due to acute excitotoxic brain injury. Neuroradiologists should be familiar with this process because of its central position in many of the disorders encountered in daily practice.

## PO12:119

### MULTICENTRIC INFANTILE MYOFIBROMATOSIS WITH CNS INVOLVEMENT – A PRE- AND POSTCHEMOTHERAPY MRI STUDY

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PURPOSE

Unusual presentation of a common infant tumour before and after chemotherapy

METHODS

Infantile myofibromatosis is the most common fibrous tumour in infancy first described in 1954 (1). It is characterized by the formation of solitary or multicentic (2) firm nodules in the skin, soft tissues, bones and internal organs. We present a case of prenatally diagnosed duodenal obstruction and solitary tumour in the soft tissue of lower extremity. Postnatal MRI showed multiple lesions in the soft tissues of the trunk, pelvis and extremities and multiple nodular lesions in both lungs. In the cerebellum small, intraaxial nodules with intense contrast uptake were noticed. During surgery for duodenal obstruction, multiple myofibromas in the small and large bowel were observed. Because of the risk of progressive small bowel obstruction the child was treated with low dose chemotherapy. MR examination after 10 weeks of treatment showed partial regression of lung and soft tissue lesions. The post treatment contrast uptake of the lesions in soft tissues and lungs has changed from being peripheral with rim enhancement to more homogenous contrast uptake indicating increasing vascularisation. Opposite to this the cerebellar lesions showed progression, although the previously intense contrast uptake disappeared, possibly due to restoration of blood brain barrier malfunction.

RESULTS

Post chemotherapy, partial regression of non-CNS lesions, but increased lesion vascularisation was observed. The CNS lesions showed continuing growth, but disappearence of the contrast enhancement.

CONCLUSIONS

An MRI study of generalized, multicentric, infantile myofibromatosis in different locations pre-and post-chemotherapy is presented. The contrast-enhancement post-chemotherapy showed different patterns in the various tumour locations.

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## PO12:120

### FILUM TERMINALIS CYST: A NEW SPINAL CORD EMBRYOLOGICAL ABNORMALITY

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INTRODUCTION

Secondary neurulation, comprising canalization and retrogressive differentiation, is responsible for the embryological development of the caudal spinal cord. Tight filum terminale, filar lipoma and ventriculum terminale persistence are the main abnormalities found at this development stage. Herein we present a large filum terminale cystic lesion that we believe results from an abnormal pattern of embryological development.

CASE REPORT

A 6-year-old boy presented with subacute gait impairment. Neurological examination revealed a mild flaccid paraparesis. MRI showed a large well-defined intradural lesion from T11 to S2 levels, surrounded by fat tissue. In its upper limit this lesion had a centromedullar position, apparently corresponding to conus medullaris. The lesion had a segmented, beaded appearance, pushing the cauda equine roots aside. Incompletely formed posterior S1 arch and rectal dilation were also found. Surgical resection revealed a fat-surrounded voluminous cyst, microscopically shown to have a flattened cuboid cells wall and glial stroma content. After surgery the patient completely recovered from motor disturbance.

DISCUSSION

In our patient, imaging combined with pathological data supports that the observed lesion results from a derangement in the late stages of embryological development.

We speculate that normal embryological evolution was blocked during retrogressive differentiation, leaving the filum terminale in an intermediate stage as was suggested by the beaded appearance of the cyst. The surrounding fat that we have encountered further supports this idea; although it can be found in 4–19% of normal subjects, it is frequently associated with tight filum terminale, a well-known feature of deranged secondary neurulation. Furthermore, incomplete formation of S1 posterior arch was also found which, as it is invariably seen in tight filum terminale patients, strengthens our hypothesis. The fact that our patient presented complains so late after birth, at 6 years of age, probably is explained by cord progressive tethering with child's growth.

## PO12:121

### MR IMAGING FINDINGS IN HINBRAIN CHIARI MALFORMATIONS

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PURPOSE

In 1891 Hans Chiari has described malformations of dorsal induction, occurring at the 4th week of gestation, where hinbrain descends into the upper cervical canal. The aim of this study is to review MRI findings in Chiari I, Chiari II, Chiari III and Chiari IV malformations.

MATERIAL AND METHODS

Chiari malformations were found in 26 patients (18 male and 8 female) with age range from day 1 to 60 years (mean age 16.7 years).

MR examinations were performed on 1.0T, 1.5T or 3.0T MR scanner using

Conventional MR sequences in axial and sagittal planes. In 10 cases DWI, MR angiography and/or MR myelography were additionally perfomed.

RESULTS

Chiari I anomaly (derebellar tonsils descend into the upper cervical canal(5 or more mm) was found in 16 patients (12 male and 4 female) with a mean age of 26.4 years. The anomaly was associated with syringohydromyelia in 4, and hydrocephalus in 3 patients.

Chiari II anomaly was found in 7 patients (3 male and 4 female) with a mean age of 1.7 years. Myelomeningocoele and hydrocephalus was present in 5 patients.

Chiari III and IV anomalies were found in two male newborns each.

CONCLUSIONS

MR imaging is the methods of choice for differentiation of different Chiari malformations. Exact location of hinbrain structures on MR images is important for early diagnosis and therapy decisions.

## PO12:122

### UNUSUAL NEUROIMAGING MANIFESTATIONS OF NEUROCUTANEOUS SYNDROMES IN CHILDREN: AN UPDATE

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PURPOSE

Neurocutaneous syndromes are genetic disorders of ectoderm differentiation. These disorders usually first appear as skin lesions like birthmarks and then, they can affect the central nervous system. The purpose of this educational exhibit is to illustrate the most uncommon neurocutaneous syndromes in children with a correlation between cutaneous lesions and neuroradiological findings.

METHODS

In a retrospective review of 135 children affected by neurocutaneous syndromes who were referred to our department at a tertiary children's hospital over the last ten years, we have selected the most unusual phakomatoses as well as unusual manifestations of more common diseases such as neurofibromatosis. A total of 32 patients with interesting findings on CT or MR imaging were selected and the most surprising cases will be presented as a pictorial essay with didactic purposes.

RESULTS

We found 116 patients with common neurocutaneous syndromes: types 1 and 2 neurofibromatosis (97), tuberous sclerosis (10), Sturge-Weber syndrome (5), ataxia-telangiectasia (2), von Hippel-Lindau disease (2); and 19 uncommon diseases: hypomelanosis of Ito (3), epidermal nevus syndrome (2), incontinentia pigmenti (1), neurocutaneous melanosis (3), PHACES syndrome (4), diffuse neonatal hemangiomatosis(2), Parry-Romberg syndrome (4).

CONCLUSIONS

There are many neurocutaneous syndromes with onset in the pediatric age. Many syndromes can lead to several neoplastic processes, so radiologists should know the imaging findings in order to recognize the disease and make the earliest diagnosis. Patients should be managed by a multidisciplinary team including pediatric dermatologist, pediatric neurooncologist and expert neuroradiologist.

## PO12:123

### CLINICAL EXPERIENCE WITH GADOBENATE DIMEGLUMINE FOR CONTRAST-EN-HANCED PAEDIATRIC MR IMAGING

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PURPOSE

To summarize safety and efficacy of the higher-relaxivity gadolinium (Gd) agent gadobenate dimeglumine (Gd-BOPTA or MultiHance) in children.

METHODS

Safety was evaluated in 151 subjects receiving gadobenate dimeglumine at a dose of 0.1 mmol/kg, 85 of whom participated in a comparison study in which 89 subjects received equimolar gadopentetate dimeglumine (Gd-DTPA or Magnevist). Image quality was evaluated in 70 patients receiving gadobenate dimeglumine, including 29 children with enhancing lesion compared with 34 children receiving gadopentetate dimeglumine. Serial 24 h blood and urine collections were used to determine gadobenate dimeglumine pharmacokinetics (PK) in 25 healthy children.

RESULTS

18/151 patients (11.6%) experienced adverse events (AE), most of which were mild. The most commonly reported AE were fever and headache. Modest increases and decreases in vital signs were recorded, but no significant changes in laboratory parameters or ECGs were observed. In the comparison study, AE rates were similar after gadobenate dimeglumine (11 subjects, 13%) and gadopentetate dimeglumine (13 subjects, 14%), $p=0.75$. PK data best fit a 2-compartment model, with >90% recovery in urine at 24 h. In children with enhancing lesions, contrast enhancement was considered good to excellent in all subjects. gadobenate dimeglumine resulted in improved definition of disease extent, lesion border delineation, and visualization of lesion internal morphology. In the comparison study, postdose changes in lesion visualization were significantly greater for gadobenate dimeglumine than gadopentetate dimeglumine at the lesion ($p=0.011$) and patient level ($p=0.008$).

CONCLUSIONS

gadobenate dimeglumine is well tolerated, with safety and pharmacokinetics comparable to other Gd agents. Compared to gadopentetate dimeglumine, gadobenate dimeglumine performed significantly better for visualization of CNS tumors in pediatric patients.

## PO12:124

### FUNCTIONAL MAGNETIC RESONANCE IMAGING IN CHILDREN WITH INTRACERE-BRAL LESIONS- CLINICAL APPLICATION AND OUTCOME. PRELIMINARY STUDY

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PURPOSE

To investigate the role of preoperative blood oxygen level dependent (BOLD) functional magnetic resonance imaging (fMRI) to neurosurgery and depicting the relationship between eloquent cortical areas and brain lesions with fMRI before surgery.

METHODS

18 patients (7girls and 11 boys) with different brain lesions were included in this study. They underwent routine MR examinations (T1WI, T2WI) with navigational protocol and BOLD-fMRI. During fMRI patients were asked to perform precise hand or feet movement as well as tasks concerning speech reception and expression, appropriate for their age and abilities. The data of BOLD-fMRI were analyzed and activation mapping of the brain were produced. The relationships between functional cortical areas and brain lesions were demonstrated, and were used to improve the presurgical planning. Functional brain mapping were integrated with intraoperative navigation system.

RESULTS

ALL 18 patients were underwent intracranial surgery. Histopathological investigations revelaed: 9 gliomas (WHO I, II and III), 5 focal cortical dysplasias (type IIA and IIB), 2 arteriovenous malformations, 2 cavernous hemangiomas. There was good correlation between preoperative fMRI and intraoperative cortical stimulation

CONCLUSIONS

Our preliminary data suggest that fMRI may help to non-invasively identify the relationship between the brain lesions and the functional cortex, therefore, provide reference for neurosurgery.

BOLD-fMRI is a clinically useful technique for preoperative mapping of eloquent cortices.

fMRI can precisely localize areas of cortical function in patients undergoing treatment planning for tumors so that therapy can be directed away from regions of residual function.

## PO12:125

### FETAL BRAIN HMRS: A NEW METHOD FOR THE EVALUATION OF BRAIN DEVELOPMENT AND PATHOLOGY?

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MATERIAL AND METHODS

Study was carried out in 66 single fetuses of 18 to 40 weeks gestation. Spectra were acquired on a Excite 1.5T system, torso coil. The size of the nominal volume of interest (VOI) varied depending on the size of the fetal brain. For localization, point-resolved spectroscopy (PRESS) at short TE=30 ms was applied. All cases were divided in two groups: with brain malformation (diagnosed on MRI) and without this defect. Fetal brains spectra were acquired in axial and coronal plane. For data investigation, the SAGE application (GE) was used.

RESULTS

In all cases the signal for N-acetylaspartate (NAA), inositol, choline, and creatine was measured. An increase of NAA for both groups was observed, but the increase for the group without brain malformation was more significant. Significant reduction of choline and inositol was noticed for both groups. Also the ratio of Cho/Cr in relation to gestational age was observed. This ratio was more significant for group without brain defects. Finally, the ratios of NAA/Cr, Lac/Cr and Ino/Cr in relation to gestational age were compared.

CONCLUSIONS

The results demonstrate a usefulness of proton MR spectroscopy in evaluation of human fetal brain's metabolism. HMRS in the human fetal brain could have in future a diagnostic value as a factor of the fetal brain development.

## PO12:126

### MRI OF THE FETAL BRAIN: A PICTORIAL REVIEW

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PURPOSES

Review the normal fetal brain development, the specific CNS disorders and the clinical applications of fetal MR imaging.

METHODS

We performed a retrospective study from 2005 to 2008 of our MRI database and found 95 fetal studies. Written informed consent is always obtained. The fetal MRI is routinely performed on 1.5T MR scanners (Philips Intera; Best,The Netherlands), using ultrafast MR techniques known as single-shot FSE, T1 FSE, FLAIR and diffusion weighted imaging (DWI).Three orthogonal planes of the fetal brain, transaxial, coronal and sagittal views are obtained. Maternal breathing may be overcome by using breathhold during the acquisition. Brain MR examinations are performed on fetuses with a gestational age of 18th to 40th week.

RESULTS

Fetal CNS imaging allows evaluation of the brain anatomy, cortical development, and can improve diagnosis of neural proliferation and migration disorders and others; we found 2 tuberous sclerosis, 9 callosal agenesis, 2 myelomeningocele, 2 tethered spinal cord, 6 Dandy Walker spectrum, 1 holoprosencephaly, 2 pachygyria, 1 lissencephaly, 1 schizencephaly and 18 hydrocephalus.

CONCLUSIONS

MR imaging is increasingly being used to evaluate the fetal brain, and is a valuable complement for prenatal ultrasound.

Fast MR imaging is an important tool for prenatal imaging when an anomaly is suspected by sonography.

Fetal MR imaging has higher contrast resolution than prenatal ultrasound and allows better differentiation of normal and abnormal tissue.

Moreover MR is contributing to our understanting of brain development.

Normal fetal brain development can be assessed in vivo on MR images. The interpretation of the findings is based on the knowledge of the histological background.

The layers of parenchyma do not display enough impedance differences to be delineated sonographically.

## PO12:127

### THE VALUE OF PROTON MRS IN THE ASSESSMENT OF FUNCTIONAL AND STRUC-TURAL REORGANIZATION OF BRAIN IN CHILDREN WITH CEREBRAL PALSY–INITIAL REPORT

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PURPOSE

To present initial results of proton MR spectroscopy in children with cerebral palsy as a basis for further evaluation of brain reorganization after one year rehabilitation.

MATERIAL AND METHODS

Material consists of 34 children (22 m, 12 f), aged 2,2–15,68 years (mean: 8,27), divided into 5 subgroups: (1) right-(n=7) and (2) left-sided (n=5) hemiplegia, (3) diplegia (n=13), (4) quadriplegia (n=9). Control group consists of 44 children (24 m, 20 f), aged 1,52–18,25 years (mean: 10,58).

N-acetyloaspartate, creatine, choline and myoinositol levels and their ratios were obtained and calculated in four symmetrical localizations: cortex of frontal lobe, frontal operculum, temporo-occipito-parietal junction and basal ganglia.

RESULTS

Statistically significant differences ($p<0,005$) in metabolites levels and ratios among clinical subgroups and control group were absent in subgroup 3 except for basal ganglia on the right. The most differences were found in subgroup 4. Paradoxically, in subgroup 1, with an injury of the left hemisphere, there were more differences in the right hemisphere and in subgroup 2, with an injury on the right, there were more differences on the left. Statistically significant differences ($p< 0,005$) in metabolites ratios between the right and left hemisphere in study group were noted, as expected, in subgroups 1 and 2 (group 1: NAA/mI, mI/NAA in the operculum; group 2: frontal mI/Cho, mI/Cr at the junction and Cho in basal ganglia). In group 3 only mI/NAA differed in the basal ganglia in both hemispheres.

CONCLUSIONS

Differences between hemispheres in children with hemiplegia may be attributed to one-sided brain injury. The more pronounced differences between these children and control group in the hemisphere contralateral to injury suggest interhemispheric transmission and brain plasticity.

## PO12:128

### DIFFUSION-WEIGHTED IMAGING OF THE BRAIN IN CHILDREN WITH TUBEROUS SCLEROSIS: A COMPARATIVE STUDY

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PURPOSE

To evaluate diffusion imaging characteristics of parenchymal changes in patients with tuberous sclerosis (TS) compared with that in control subjects.

MATERIALS AND METHODS

Six children with known TS were included in this study. We reviewed magnetic resonance (MR) and diffusion-weighted (DW) imaging findings of six patients (4 male, 2 female, mean age: 9.33±2.73 years) diagnosed with TS between December 2004 and October 2007 at our department. The MR imaging examinations were performed in a 1.5 Tesla MR unit using a transmit/receive coil with T1W and T2W spin-echo and FLAIR sequences. DW MR imaging was obtained using the echo-planar imaging sequence. The apparent diffusion coefficient (ADC) values were studied. In addition, five normal children were studied for comparison.

RESULTS

ADC value was higher in cortical tubers than in the corresponding cortical location of controls. ADC values were higher in white-matter lesions and perilesional white matter than in both the contralateral normal-appearing white matter of patients and in controls. There were no significant differences for ADC values in the normal appearing white matter of patients with TS compared to controls.

CONCLUSIONS

We think that DW MR imaging with ADC calculations appeared to be a promising and useful sequence to evaluate the changes in the brain tissue in TS, and should be routinely added to conventional MR sequences. In particular, ADC mapping may be used in distinguishing hamartomas from secondary lesions with T1W, T2W and FLAIR signal capacities similar to hamartomas and different diffusion characteristics.

## PO12:129

### DOES AMYGDALA, PUTAMEN AND GLOBUS PALLIDUS VOLUMES DIFFER BETWEEN HEALTHY PEOPLE AND THOSE WHO STUTTER – VOLUMETRIC MRI ASSESSMENT?

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PURPOSE

The cause of persistent developmental stuttering (PDS) remains unknown. Most of imaging researches in stutterers focus on possible cortical defects in speech-related areas. Whereas some speech pathologists suggests that developmental stuttering may have more to do with malfunction of subcortical structures, especially with amygdala. Therefore our purpose was to find out if there is evidence that the size and symmetry of some subcortical structures are different in stuttering people than in healthy subjects.

METHODS

We examined 24 people suffering from persistent developmental stuttering and 20 controls matched for age and gender. All of them were right handed. MRI examinations were performed on 1,5-T scanner using volumetric T1-weighted gradient echo sequence. Volumes of amygdala, putamen and pallidum have been estimated by means of semiautomated method. Acquired data were compared between groups using t-test. Asymmetry coefficient has been calculated.

RESULTS

Mean left amygdala volume was 2,27±0,36 cm3 in stuttering group and 2,27±0,24 cm3 in controls, on the right side 1,79±0,30 cm3 and 1,80±0,20 cm3 respectively. Mean left putamen volume was 4,07± 0,58 cm3 in stuttering group and 4,18±0,36 cm3 in controls, on the right side 4,02±0,53 cm3,and 4,14±0,37 cm3 respectively. Mean left glubus pallidus volume was 1,07±0,16 cm3 in stuttering group and 1,12±0,1 cm3 in controls, on the right side 1,08±0,14 cm3 and 1,1± 0,1 cm3 respectively. Asymmetry coefficients in stuttering group were (amygdala, putamen, pallidum): 0,12±0,01, 0,01±0,02,-0,01±0,05; and in controls: 0,11±0,03; 0±0,02; 0,01±0,03. Statistical analysis did not reveal any significant differences between both groups in amygdala, putamen and pallidum volumes nor any significant asymmetry concerning these structures.

CONCLUSIONS

The study did not confirm the hypothesis that subcortical nuclei may play a role in the pathogenesis of persistent developmental stuttering.

## Spine and spinal cord

## PO13:130

### THE VALUE OF THE USE OF DIFFERENT FLOW RATES IN THE STUDY OF THE ARTE-RY OF ADAMKIEWICZ BY USING MULTI-DETECTOR ROW CT

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BACKGROUND AND PURPOSE

The artery of Adamkiewicz (AKA) is extremely important because anterior spinal artery (ASA) receives blood supply from the anterior spinal artery and alteration of these vessel may produce ischemic complication of the spinal cord in particular after surgery of the thoracoabominal aorta. The aim of this work was to investigate the diagnostic performance and the effect of different flow rate in the multidetector row computed tomography angiography (mdCTA) imaging of AKA.

MATERIAL AND METHODS

We retrospectively studied CT data set of 100 patients that underwent to MDCTA examination of thoracoabdominal aorta and we analyzed the AKA presence and characteristics. All examinations were performed with a four detector row CT scanner and in every patients we used iopromide 370 mgml as contrast medium. Patients were divided in 4 equal groups:

1) 130 mls at 3 mlsec

2) 130 mls at 4 mlsec

3) 130 mls at 5 mlsec

4) 130 mls at 6 ml sec

The presence and image quality of AKA was scored between 0 to 3. In the imaging study, we used axial images, MIP and CPR reconstructions.

RESULTS

By using 3,4,5 and 6 mlsec flow rate we observed respectively 8, 10, 11, 14 AKA. Image quality values were 4275, 4575, 4975 and 5375 for group 1–4 respectively. There was so a statistical difference between group 4 and group 1 ($p=0.031$), group 2 ($p<0.047$)

CONCLUSIONS

Results of our study show that to achieve diagnostic image quality in the artery of Adamkiewicz is useful the use of the high injection rates, in particular the use of 6 mlsec flow rates displays better results.

## PO13:131

### ARTERY OF ADAMKIEWICZ HOW TO DETECT IT BY USING MULTI-DETECTOR ROW CT

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BACKGROUND AND PURPOSE

The artery of Adamkiewicz (AKA) is extremely important because anterior spinal artery (ASA) receives blood supply from the anterior spinal artery and alteration of these vessel may produce ischemic complication of the spinal cord in particular after surgery of the thoracoabominal aorta.

LEARNING OBJECTIVES

To understand the anatomy of the artery of Adamkiewicz. To review the current indications for performing multidetector row CT for the study of the artery of Adamkiewicz assessing radiation exposure and diagnostic efficacy. To learn the CT technical parameters to be used. To understand the potential pitfalls.

PROCEDURE DETAILS

MDCTA images of 15 patients (9 males; 3 females; mean age 59 years, age range 41–73 years) were retrospectively reviewed. MDCTA exams were performed with a multi-detector row scanner, after intravenous bolus administration of 130 mL of non-ionic contrast material using a 3–5 mL/sec flow rate. We assessed each patient by using axial scans, multiplanar reconstruction (MPR), maximum intensity projection (MIP), single surface display (SSD) and volume rendering (VR) techniques. We present relevant case and post-processed images.

CONCLUSIONS

MDCT detects with precision artery of Adamkiewicz and allows to adequately evaluate its origin, course and dimension.

## PO13:132

### SPINAL HYDATID DISEASE – CASE REPORT AND LITERATURE REVIEW

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PURPOSE

Hydatid disease in humans is caused by the larval stage of the tapeworm Echinococcus granulosus. It is rare, even in endemic regions of the world. We report a case of hydatid disease of the spine and discuss the radiological features of this uncommon condition.

METHODS

A 67-year-old female presented with complains of long-standing back pain and gradually increasing weakness of the left leg.

CASE REPORT

CT and MRI scans of the spine showed a large dorsal osteolytic expansile mass involving the T12 body and pedicle, with epidural and paravertebral extension, containing multiple spherical thin-walled fluid-filled cysts. It was displacing the spinal cord to the right and obliterating the adjacent left intervertebral foramina. Based on imaging findings and on serology, the diagnosis of spinal hydatid disease was made and antihelminthic therapy was started. During the 18 months follow-up period the patient had partial neurologic improvement and MRI scans showed mild reduction of the lesion.

CONCLUSIONS

Although extremely rare, spinal cord hydatid disease should be considered in the differential diagnosis of spinal cord compression syndrome or radiculopathy in endemic countries.

## PO13:133

### ARACHNOIDITIS OF THE LUMBAR SPINE DUE TO REPEATED MECHANICAL STRESS

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PURPOSE

Arachnoiditis of the lumbar spine is a severe complication affecting the cauda equina after various etiologies including disc surgery and trauma. We report a case of a patient arachnoiditis of the cauda equina due to repeated mechanical stress. The whole imaging work-up of this case was possible with a single Upright-MRI examination.

CASE REPORT

After disc surgery because of a large disc protrusion at level L5/S1, a 44 year old female patient was free of symptoms. Eleven years later, she complained about sciata in standing and sitting position as well as gait disturbance and dysesthesia which increased continuously over two years. A MRI scan at age 55 of the lumbar spine revealed a normal alignment of the vertebral bodies and normal epidural scar formation after disc surgery. Two years later, using Upright MRI, we could demonstrate a slip of 10 mm of L4 on L5 in the upright position as compared to the recumbent position in the adjacent segment L4/L5 resulting in a severe compression of the dural sac. After contrast media application, the nerve roots of the cauda equina did strongly enhanced at the level of the maximum compression of the dural sac.

CONCLUSIONS

This case report emphasizes the value of Upright MRI in the diagnostic of disorders of the lumbar spine. In a sole examination, the post operative situation, the newly developed adjacent instability and the arachnoiditis due to the repeated mechanical stress incurring during the compression of the dural sac could be depicted.

## PO13:134

### SPONDYLOLISTHESIS AND POSTERIOR INSTABILITY

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PURPOSE

Spondylolysis is a common disorder affecting the lumbar spine. Spondylolisthesis is a complication of spondylolysis when one vertebra is displaced upon the other. Symptoms due to nerve root compression are thought to occur only in patients with spondylolisthesis. Instability of vertebral slip is considered a major cause for neurological symptoms.

CASE REPORT

We present a case of a patient with a spondylolisthesis of L5 on S1 due to spondylolysis at the level L5/S1. The vertebral slip is fixed and no anterior instability is found. Using functional MRI in an Upright MRI scanner, a posterior instability at the level of the spondylolytic defect of L5 can be demonstrated. The enlarged pedicles are bilaterally displaced toward the L5 nerve root and a bilateral contact of the displaced and enlarged pedicles with L5 nerve root the can be shown in extension of the spine. The movement of the pedicle arises in the spondylolytic defect showing a yet unreported form of instability.

CONCLUSIONS

This is the first case described of such a posterior instability in patients with spondylolisthesis. The clinical implications of posterior instability are not clear yet, but it might explain persisting low back pain and possibly radicular symptoms in patients with spondylolysis with or without spondylolithesis. It is thought, however, that this disorder is not uncommon and that it can only be diagnosed using Upright MRI.

## PO13:135

### INFLUENCE OF MRI-DETECTED MODIC CHANGES ON THE CLINICAL OUTCOME AF-TER SURGERY FOR LUMBAR DISC HERNIATION

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PURPOSE.

Previous studies have indicated that degenerative bone marrow and endplate changes in the lumbar spine, known as Modic changes(MC), are strongly associated with low back pain(LBP). The purpose of this study was to evaluate if the presence of MC preoperatively can predict the clinical outcome after lumbar disc herniation surgery.

METHODS

224 patients were followed for two years after their first lumbar disc herniation surgery. The follow-up included registration of Oswestry Disability Index(ODI) and Visual Analogue Scale for low back pain (VAS-LBP) preoperatively and 24 months after surgery. Pre-operative MRI of the lumbar spine were independently evaluated by two radiologists blinded for patient history and outcome. The presence of MC was registered, and when present the type and distribution of these changes were evaluated. According to the MRI findings the patients were divided into 4 groups; no MC, type-I, type-II and mixed type-I/II. The changes in ODI and VAS-LBP after surgery were compared between the 4 groups using ANOVA tests.

RESULTS

70 women and 127 men with a mean age of 41 years(range 16y.-78y.) were examined. 28 patients(14,2%) had type-I MC, 82 patients (41,6%) had type-II, and 7 patients(3,6%) had mixed type-I/II.

For the whole group the improvement in ODI 2 years after surgery was-29,8 (95% Confidence Interval-33,8 to-25,9) and the improvement in VAS-LBP was-23,4 (95% CI-28,0 to-18,7). All the groups experienced improvement. There were however no significant differences in the change of neither ODI nor VAS-LBP between the 4 groups.

CONCLUSIONS

Although MC are suspected to be a cause of LBP, the presence of MC preoperatively did not influence the clinical outcome 2 years after lumbar disc herniation surgery in our study. Both the patients with no MC and those with type-I, type-II and mixed-I/II had a significant improvement in both ODI and VAS-LBP.

## PO13:136

### MAGNETIC RESONANCE IMAGING FINDINGS IN SEVERE MULTIFOCAL MOTOR NEU-ROPATHY CAUSED BY RADICULAR AND PERIPHERAL NERVE CONDUCTION BLOCKS

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Multifocal motor neuropathy (MMN) is an acquired autoimmune demyelinating neuropathy with slowly progressive weakness and fasciculations without permanent sensory loss. Based on the clinical, laboratory, and electrodiagnostic features, 7 patients were diagnosed with definite MMN in our series. The objective of this study was to show MRI findings on cervical spine and brachial plexus in patients with severe and progressive MMN. Other diagnostic methods included neurological examination, electromyography, nerve conduction studies, serum immunoelectrophoresis, antiganglioside antibodies testing and CSF analysis. Magnetic resonance imaging (MRI) examination was performed on scanner 1.5 T. Following MR sequences and planes were used: saggital T2 weighted (T2W), T1-weighted (T1W) and fat suppression T2W, axial T2W and T1W sequences in the level of third cervical to first thoracal vertebral body and post contrast T1W in three planes. In all patients MRI revealed increased signal intensities in the cervical roots (C5-C8) and in the proximal segments of brachial plexus on T2-weighted and fat suppression T2-weighted sequences. In all patients severe asymmetric weakness of muscles inerveted by radial, ulnar, median and peroneal nerves was observed and the most striking presentation was bilateral wrist and finger drop. EMG showed denervation, the most severe in distal muscles inervated by radial nerves. MRI examination of brachial plexus seems to be very important for detection of plexopathy in patients with symptoms of multifocal motor neuropathy.

## PO13:137

### THE ROLE OF T2W FS SEQUENCE IN DIAGNOSIS OF NONTRAUMATIC BRACHIAL PLEXOPATHIES

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Magnetic resonance imaging (MRI) is the method of choice for evaluating patients with nontraumatic brachial plexopathy. Methods: One-year retrospective study included patients with nontraumatic

brachial plefopathy. In all patients typical clinical finding was confirmed by upper limb neurophysiological studies. In all of them we performed multiplanar T2w FS and pre and postcontrast T1w FS images of cervical spine and brachial plexus by 1,5 T MR scanner. Results:Eighteen patients (11 men et 7 women) met inclusion criteria. Three patients had multifocal motor neuropathy, 5 had malignant disease (1 chronic lymphocytic leukemia, 2 metastases of breast cancer, and 2 metastases of lung cancer). Two patients had primary neurogenic tumors of the brachial plexus, 4 radiation fibrosis, 3 had neuralgic amyotrophy of Parsonage-Turner's type and 1 cavernous malformation in the posterior cervical space. Conclusions:Evaluation of the brachial plexus presents a great challenge to the clinician and radiologist. According to our results, there are several causes of brachial nontraumatic plexopathy which could be possible to distinguish by MRI. In cases with unclear etiology additional investigations (immunological another analysis of the blood and CSF, repeated electrophysiological studies) could help in definitive diagnosis. In all cases we registered increased T2w FS signal of altered nerves, and postcontrast changes only in patients with tumor infiltration. T2w FS sequence is useful in diagnosis of nontraumatic brachial plexopathies with high sensitivity and low specifity compared with postcontrast T1w sequence.

## PO13:138

### DEMONSTRATION OF SPINAL EPIDURAL VASCULAR MALFORMATION ON CONTRA-ST ENHANCED MRA IN A CASE OF SPONTANEOUSLY RESOLVED ACUTE EPIDURAL HEMATOMA

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PURPOSE

To report a usefulness of contrast enhanced MRA for detecting a spinal epidural vascular malformation

MATERIAL AND METHOD

A 39-year-old male had noticed sudden onset back pain and paresthesia of lower legs.Soon he noticed weakness of lower legs. He had admitted to another hospital. MRI demonstrated spinal epidural hematoma. Because his neurogical symptoms improved, he was under observation. He developed weakness again 5 days later after the onset and he moved to our hospital.

Plain MRI showed no flow void suggesting vascular malformation. MRA was performed with TRICS(time resolved imagings of contrast kinetics). This study showed pooling of contrast media in the spinal epidural hematoma. Spinal angiography demonstrated vascular malformation supplied by right supreintercostal artery. No definte drainage vein was seen. Follow up MRI after 1 week showed disappearance of the spinal epidural hematoma and improvement of the patient fs symptoms.

RESULTS

Although the hematoma has resolved, to prevent further hemorrhage the operation was done. Abnormal vessels were noted on the dorsal surface of dural mater. Histopathological analysis revealed an arteriovenous malformation.

CONCLUSIONS

Without contrast enhanced MRA, this patient might have diagnosis of idiopathic spinal epidural hematoma. Contrast enhanced MRA is strongly recommended for spinal epidural hematoma even in case which showed resolution of hematoma.

## PO13:139

### LIGAMENTUM FLAVUM IN BAASTRUP'S DISEASE: COMMUNICATING CHANNEL BE-TWEEN FACET JOINTS AND INTERSPINOUS SPACE

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PURPOSE

This study was performed to evaluate MR imaging findings of ligamentum flavum and relationship between facet joints and interspinous bursitis on Baastrup's disease.

METHODS

The study group consisted of 23 patients with Baastrup's disease underging routine spine MR imaging. The diagnosis of Baastrup's disease was based on the presence of high T2 signal (similar to that of fluid) in the narrow interspinous space and flattening and sclerosis of the apposing surfaces of the spinous processes on sagittal MRI or frontal and lateral radiographs, or both. Retrospective review evaluated for the presence of: fluid collection of facet joints and interspinous spaces. Presence of hypertrophy and signal change of ligamentum flavum on T2-weighted images was evaluated.

RESULTS

Lumbar interspinous bursitis was present at 34 levels in 23 patients. Facet joint effusion was present in 19 levels. Hypertrophy with high signal intensity at ligamentum flavums on T2-weighted images was demonstrated in 10 cases of 19 patients with facet joint effusion.

CONCLUSIONS

82% of the Baastrup's disease shows facet joint effusion. High signal intensity with hypertrophy in ligamentum flavum was noted in 52% of facet joint effusion. In Baastrup's disease, abnormal communicating channel through ligamentum flavum between interspinous bursa and facet joints may frequently be detected on MR imaging.

## PO13:140

### DIFFUSION TENSOR IMAGE OF THE CERVICAL SPINE–THE MOST SUITABLE COIL SELECTION AND IMAGING DIRECTION–

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PURPOSE

To find the most suitable coil and the best slice directions for spinal cord DTI.

To find unfit subjects for cervical spinal cord DTI and to discuss the clinical applications and usefulness.

MATERIALS AND METHODS

Three volunteers were chosen for cervical DTI. Volunteers were selected among those not only with slender neck and with gradual lordotic curve but also keeping mind with less dental prosthesis. Six axis DTI program was used by ordinary 1.5T unit. with SE EPI, Tr 2000 20000 msec, Te 84 msec, slice thickness 3 mm, gap 0, NEX 6 12, SPIR on. can time is ranging from 400 sec to 900 sec depending upon the number of slices. Slice directions are axial, coronal, and sagittal. Coils are head coil, head and neck coil and Flex-M. Fiber tracking reconstruction software were Pride nd DTV II.

RESULTS

There was no difference among the 3 axis (Ax, Sag, Cor) on the point of image distortion and S/N ratio, however sagittal slice are most suitable because the number of slices can be decreased and consequently NEX can be increased. It would be advisable that the whole cervical spinal cord should be included in the several identical slices, because the in-plane resolution is far more precise than the resolution of slice direction. Head and neck coil was the most suitable for cervical DTI, because the sensitivity map is more uniform than others. There was no essential difference between the Pride and TV II or tracing the fibers. However, the parameters for tracing the fibers are somewhat different. Image quality is largely depend upon the shape and the length of the neck. Differential diagnosis between the extra and intra can be easily made merely by images. Cervical spinal cord DTI is fascinating images, however still evolving.

## PO14:141

### CARBON COATED Fe AND Fe3O4 DERIVED NANOPARTICLES FOR MRI CONTRAST

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Results of a combined XRD, magnetic, XAFS and Moessbauer spectroscopy study of new magnetic nanoparticle materials derived from iron metal and iron oxide are presented. The samples of carbon coated nanoparticles have been obtained by arc melting of graphite electrodes willed with metallic Fe or magnetite. Three fractions of nanoparticles from different places of the furnace: top, walls and bottom have been collected. In order to determine the local structure and the Fe valence state in the materials, the X-ray absorption fine structure spectroscopy (XAFS) and the Moessbauer spectroscopy were used.

The XAFS experiments were performed at the Fe:K edge at room temperature in Hasylab/DESY, Hamburg. Metallic Fe, hematite, maghemite and magnetite were used as references. The absorption edge energy and shape in the spectra of the Fe and Fe3O4 derived nanoparticle materials are similar to those of metallic iron, which reveals a reduction of magnetite to metallic iron by carbon upon arc melting. The contents of different iron species were determined from linear combination fits of their spectra with those of reference samples. The Fourier transforms of the EXAFS (Extended X-ray Absorption Fine Structure) functions of both Fe metal and magnetite derived nanoparticle materials reveal their close similarity to that of metallic Fe. However, for the Fe metal derived material the distance of the 1st neighbour peak is of 0.2 Å smaller than that in the Fe metal. This suggests a compression of the lattice, possibly due to incorporation of carbon atoms which are smaller than iron atoms.

Temperature dependences of the magnetisation as well as the hysteresis loops were measured with the Quantum Design PPMS set-up at the magnetic field up to 9 Tesla. The Moessbauer measurements have been carried out in transmission, at room temperature and at 80 K. The fits of the Moessbauer spectra gave the relative amounts of the Fe metal and carbide phase and X-ray diffraction patterns provided the average sizes of the particles. From a comparison of the XAFS, Moessbauer and magnetic measurements the amounts of individual iron species and the thickness of the carbon shells were determined. The MRI experiment performed on water suspensions of the materials indicated their high efficiency in increasing the proton T2 and T2* contrasts. The results are analysed in terms of the magnetic core properties and size, as well as the carbon shell thickness.

## PO14:142

### THE TREATMENT OF SIPHON ANEURYSMS WITH FLOW- DIVERTING STENTS

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During the last year several companies proposed the use of a new generation of stent with a flow diversion action to occlude the aneurisms of the siphon, giant or large or multiple, avoiding the use of coils.

In this period we treated several patients with this kind of aneurysms: 1, with Balt Leo, 6 with Balt Leo+, 6 with Balt Silk.

The deposition technique is very good, the early results interesting. No complications aroused in this first small series.

First results have been presented at the Elba 2008 Interventional Neuroradiology Workshop.

In this occasion we desire to present our case series with a more long term follow-up.